MADRAS HEALTH EDUCATION

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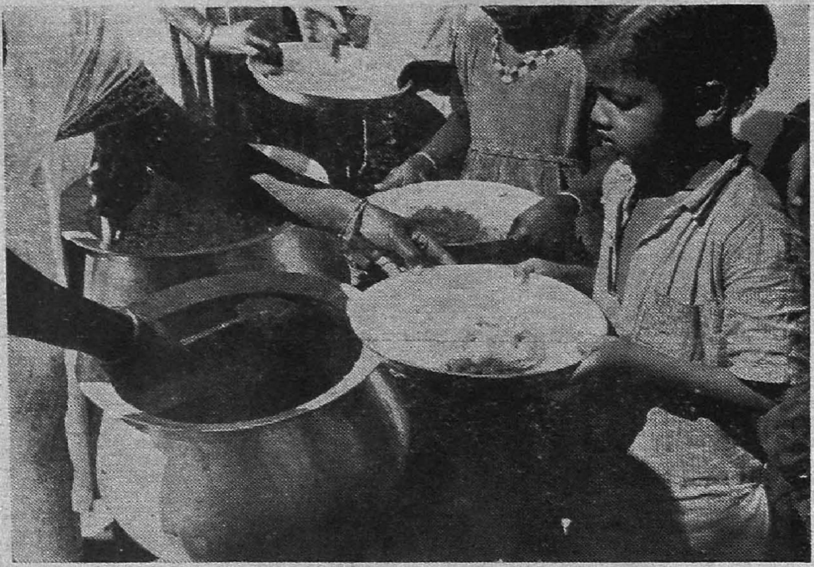
W. H. O. DAY

SPECIAL NUTRITION NUMBER



OF ALL THE DISASTERS CAUSED BY HUNGER AND MALNUTRITION, THE MOST APPALLING ONES ARE THOSE THAT STRIKE MILLIONS AND MILLIONS OF CHILDREN WHO ARE THE INNOCENT VICTIMS OF MISERY, POVERTY AND IN MOST CASES IGNORANCE.

"OUT OF ABOUT 800 MILLION CHILDREN LIVING IN THE DEVELOPING COUNTRIES IN THE TROPICAL AND SUB-TROPICAL ZONES, MORE THAN ONE HALF SUFFER FROM A SHORTAGE OF PROTEINS AND OTHER ESSENTIAL NUTRIENTS."

OTHER CHILDREN SURVIVE THEIR FIRST YEAR, BUT THOUSANDS ARE SO KEENLY MARKED BY UNDER NOURISHMENT OR MALNUTRITION THAT THEY ARE CONDEMNED TO A PRECARIOUS IF NOT MISERABLE LIFE........"

This picture shows children being served with a nourishing meal in a village school.

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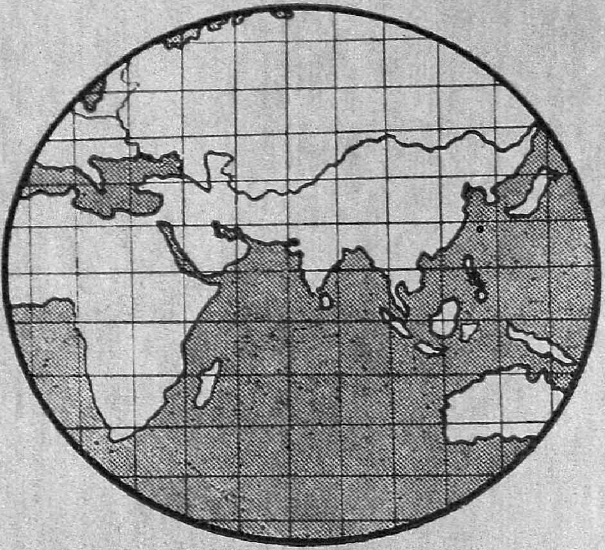
CONTENTS

	Title	Author	Page
1.	Statement by Dr. M.G Candu ..	World Health Day	... 1
2.	Balanced Diets ...	Dr. (Mrs.)Rajammal P. Devadas	... 3
3.	Catering Education in India ...	Miss T. E. Philip	... 16
4	Nutrition for a child in health and disease ...	Dr. Gomathi Venkataraman and Dr. Khair Bokhari	... 21
5	Bio-chemical Manifestations of Gammexane Intoxication ...	Dr. T. M. B. Nedungadi	... 26
6.	Nutrition in pregnancy ...	Dr. W. J. C. Rebello & Sheila Rajarathnam	... 32
7.	The present position regarding protein rich processed foods for the supplementary feeding of the vulnerable groups of population ...	M. Narayana Rao and N. Subramanian	... 39
8.	The Importance of Nutrition in Opthalmology ...	Dr Kalyan Bagchi	... 53
9.	Nutrition Education & Training	Dr. I. A. Simpson	... 65
10.	A. V Materials on Nutrition ...		

COVER PHOTO

Children in a village school near Madras enjoy a Mid-Day Meal Every Child in India should have a Balanced Meal like this: Let us ensure that increased food production—Especially of protective foods—will enable this objective to be attained.

Issued by the Director of Public Health. Free distribution



WORLD HEALTH DAY, OBSERVED EACH YEAR ON 7th APRIL AND IN THE MONTH OF JULY IN OUR STATE, MARKS THE ANNIVERSARY OF THE COMING INTO FORCE OF THE CONSTITUTION OF THE WORLD HEALTH ORGANISATION IN 1948. THE THEME CHOSEN FOR 1963 IS "HUNGER: DISEASE OF MILLIONS". WORLD HEALTH DAY WILL THUS SUPPORT F.A.O'S FREEDOM FROM HUNGER CAMPAIGN.

10 DEC 1964

WORLD HEALTH DAY

"Hunger: Disease of Millions"

By

Dr. M. G. CANDAU

Director-General, World Health Organization

THE acute famines that decimated whole populations in earlier times seldom occur today, but millions still suffer from hunger. This hunger may be due to a general lack of food, but more often it is a hunger for particular food elements such as proteins, vitamins or mineral salts. Without adequate quantities of these no one can be healthy and lack of one or more of them reuslts in malnutrition and is responsible for much of the ill-health at present in the world.

When people were facing death by famine they knew only too well what was happening to them: but today millions are ill without understanding that the cause is a total or partial lack of necessary food elements.

In those countries where most people cannot afford meat, fish, eggs, milk or nutritious vegetable foods to eat with their usual cereal meals, widespread malnutrition results in a low resistance to disease and diminished working capacity which add to the national burdens of ill-health and economic loss.

But the principal victims of this insidious form of hunger are infants and children. Millions of them become sick and many die in their early years simply because they do not get enough protein in their food while many of those who survive fall an easy prey to other illnesses of childhood.

The only lasting remedy for this widespread malnutrition is to produce inexpensive foods containing sufficient protein, vitamins and so on and persuade people to make them part of their regular diet. This may not be easy since food habits and established beliefs about food are part of the whole fabric of the life of a people, and are usually slow to change.

Certain diseases directly caused by bad nutrition such as beri-beri, pellagra, scurvy, rickets, goitre, anaemia and a type of blindness in children have with better nutrition already disappeared from many countries and would disappear everywhere if people's every-day food contained sufficent amounts of the essential-elements.

When doctors, nurses and health workers are receivtng their training it is important that they understand the close relation between good nutrition and health so that they can teach and influence the people among whom they are to work. Research is needed, too, for there are still serious gaps in our knowledge of all the ill effects of the different types of hunger.

In today's world hunger is indeed a disease of millions. The Food and Agriculture Organization of the United Nations (FAO) has launched a world-wide Freedom from Hunger Campaign in which the World Health Organization is wholeheartedly co-operating. It is my hope that on this World Health Day people everywhere in the world will try to visualize this problem of hunger and the disease and death that go with it. Remedies are largely known—they call for simultaneous action on the agricultural, medical and educational fronts and this action, to be successful, must have the participation of governments and of peoples in all countries, rich and poor.

We Eat Not Only to Live But to Live Well,

To A Healthy old Age.

BALANCED DIETS

By

Dr. (Mrs.) RAJAMMAL P. DEVADAS
M Sc.M.A., Ph.D. (Ohio State)

(Principal, Sri Avinashilingam Home Science College, Coimbatore).

AN "adequate diet" or "balanced diet" is one which provides all the essential nutrients in sufficient quantities and proper proportions to meet the needs of the body—Thus the 'balanced diet' is one which is balanced in quantity and quality, catering to the requirements of growth, development, maintenance of health and regulation of body functions

The important factors to be considered in the formulation of Balanced diet are (1) knowledge of the daily nutritional requirements, (2) selection of foods which will supply the daily nutritional requirements, (3) planning meals, (4) preparation of meals, and (5) serving meals.

Selection of Foods which will Supply the Daily Nutritional Requirements.

After finding out how much calories, proteins, minerals and vitamins are required, we should find out which foods will supply those factors in the amounts adequate to meet the needs. We must also see what types of foods are avaiable in the locality, during the different seasons, how much of those can be purchased with the money a person can spare for food, the types of food a person can include in his diet according to his habits—vegetarian or non-vegetarian, cultural background and patterns of living; religion; part of India from which he comes—Punjabi, Madrasi, Bengali and so on.

All foods can be grouped as energy giving foods, body building foods, and protective-requlatory foods. Foods giving carbohydrates, fats and proteins are the energy giving foods; foods giving protein and mineral salts are the body-building and body-tissue repairing foods; foods providing proteins, vitamins and minerals are protective foods, and that foods giving cellulose vitamins, minerals and water are regulatory foods. The food sources of some essential nutrients are given below:

Food sources of Carbohydrates :

Rice, maize (makai), oats, barley, wheat, jowar (cholam) bajra (cambu), ragi, atta, maida, bread, biscuits, other cereals tapioca, sago, potatoes, sugars, honey, jams, jellies and sweets.

WORLD NEEDS FOOD-SEE THAT NONE IS WASTED-REMEMBER THAT "HUNGER IS THE DISEASE OF THE MILLIONS"

Here are a few ways in which you can help

CUT OUT ENTERTAINMENTS OR IF YOU ENTERTAIN DO NOT BE LAVISH.

BUY ONLY AS MUSH AS YOU NEED.

DO NOT CONCENTRATE ON ONE PARTICULAR FOOD GRAIN

HELP RELIEVE FOOD SHORTAGE BY GROWING YOUR OWN VEGETABLES ON YOUR SPARE PLOTS

AT EACH MEAL OBSERVE STRICT AUSTERITY BY REMEMBERING THAT EVERY EXTRA DISH ON YOUR TABLE MIGHT FEED THOSE MORE NEEDY.

NOW AS NEVER BEFORE THERE IS URGENT NEED FOR SHARE AND SHARE ALIKE.

DISCIPLINE AND CONSIDERATION FOR OTHERS WILL HELP US TO TIDE OVER THE DIFFICULT TIMES.

Food sources of proteins :

Beans, soya bean, field beans, Bengal Gram (Chänna) blackgram (urdh). greem gram (mung), lentil (masur). peas, redgram (arhar), pulses. groundnuts. cashewnuts, almonds, gingelley seeds and oil cakes.

Eggs, milk, curds, cheese, liver, mutton, fish, poultry.

Food sources of fats :

Butter; cream, animal fat, ghee, fatty meat and fatty fish, gingellyoil, cocoaunt oil, groundnut oil, mustard oil, linseed oil and hydrogenated fats.

Food sources of Cellulose (roughage) :

Fruits such as grapes, guava, jack fruit. berries, cherries, lime, mangoes, pears, oranges, mosambis, pineapple. pomegranate, tomatoes, wood-apple and tamarind.

Vegetables such as amaranth, bitter grourd, broad beans, celery stocks, cluster beans, double beans, drumstick, tender jack, lady's finger amla, parwar, banana flower and banana skin.

Bran and whole cereals.

Food sources of calcium :

Leafy green vegetables such as agathi, amaranth, cabbage, carrot leaves, coriander leaves (dhania), curry leaves, mint, neem, spinach, water cress, milk, curds, cheese, eggs, ragi, drumstick, cluster beans.

Food sources of Iron :

Green leafy vegetables such as agathi, amaranth, cabbage carrot leaves, coriander leaves (dhania), curry leaves, mint, neem, spinach, water cress, egg yolk, ragi.

Food sources of phosphorus :

Wheat, rice, ragi, meat, milk, curds, cheese, eggs and vegetables.

Food sources of Vitamin A :

Green leafy vegetables such as agathi, amaranth, cabbage, carrot leaves, coriander leaves (dhania), curry leaves, butter, cream, egg yok, milk, cod liver oil, red palm oil, shark liver oil, liver, carrots, pumpkin, papaya, palmyra fruit, mangoes, peaches and other yellow vegetables and fruits.

Food sources of thiamine :

Bran and whole cereals such as wheat, ragi, jowar and bajra par-boiled rice, and unmilled rice.

Legumes such as dry beans and field beans.

Whole grams such as Bengal gram, green gram, black gram, legumes, liver, meat, egg yolk, yeast.

Food sources of Vitamin C :

Citrus fruits such as limes lemons, oranges, grape fruits and mosambies.

Amla, raw fresh vegetables such as green peas, bitter gourd cauliflower, cluster beans, drumstick, knol-khol, ridge gourd, turnip, tomatoes, other fresh fruits, sprouted gram.

Green leafy vegetables such as agathi, drumstick leaves, amaranth, cabbage, carrot leaves, coriander leaves (dhania) and curry leaves.

Food souces of riboflavin :

Green leafy vegetables such as agathi, amaranth, cabbage carrot leaves, coriander leaves (dhania), curry leaves, drumstick leaves, manathakali leaves, milk, eggs, liver, meat, fish, poultry yeast.

In order to know which foods from the above list and how much of each, are to be included for an adequate diet, certain " food groups " have been developed, in which foods of similar nutritive values are classified together. Adequate diets can be developed by taking sufficient quantities of foods from these different groups which are known as " The Basic Seven ", " The Basic Six ", " The Basic Five " and " The Basic Four. " These

food groups are flexible allowing for a wide choice of foods for example.

"The Basic Four" food groups include:

(i) Milk and Milk Products Group.
(Children-3 to 4 cups daily,
adolescents-4 or more cups,
adults–2 or more cups,
pregnant women-4 or more cups,
and nursing mothers-6 or more cups.)

(ii) The Meat Group-with meat, poultry fish and eggs.
(2 or more servings per day)

(iii) The Vegetable-Fruit group.
(Vegetables 4 or more servings day including a dark green or deep yellow vegetable, a citrus fruit or tomato and other vegetables and fruits.)

(iv) The cereals group (four or more servings) per day.

"Curious and Paradoxical as it may appear, it is a fact while on the one hand there is shortage of food in the country the effect of which is felt all over particularly among the poorer sections of the community, there is on the other hand a Tremendous wastage of food in various ways which can be prevented. The food that we have can go a great way in improving the Health and well being of the people if it can be utilised to the best advantage.

Dr. Rajendra Prasad

The following suggestions can serve as a guide for fulfilling the nutritional requirements in terms of the amounts of foods to be used daily for an individual. In the ranges of foods indicated the higher amounts are especially important for vegetarians.

Milk : For a growing child, two or four cups. (1 to 2 lbs. $\frac{1}{2}$ Kgm)
For an expectant and nursing mother; four cups (2 lbs. - 1 Kgm.)

For others: One to Two cups ($\frac{1}{2}$ to 1 lb. - $\frac{1}{4}$ to $\frac{1}{2}$ Kgm)

Since the economic conditions of most people do not permit consumption of milk, substitutes like skimmed milk, groundnut milk, ragi malt, may be used. It should be seen that children, and, pregnant and nursing mothers get as much milk as possible.

Leafy green or yellow vegetables :

Children	...	two ounces.
Adults	...	four ounces.

Tomatoes or citrus fruits or sprouted grams :

Children	....	one ounce.
Adults	...	two ounces.

Other vegetables (green-non-leafy

Children	...	two ounses.
Adults	...	Three ounces.

Roots and Tubers :

Children	...	two ounces.
Adults	...	three ounces.

Fruits :

Children	...	two ounces.
Adults	...	three ounces.

Eggs :

For non-vegetarian ... . One
(For vegetarians 1-2 ounces of groundnuts, other, nuts, pulses or dhals in place of the egg.)

Meat and Fish :

For non-vegetarians ... 3 ounces.
(vegetarians...3 ounces of additional dhal to be substituted in the place of meat and fish).

Cereals:

Children ... 8–10 ounces.
Adults ... 14 ounces.

Pulses : (Children 2 ounces; Adults 3 ounces.)

Fats : Children 1 ounce; Adults 2 ounces.
(including ½ ounce of butter and ghee)

Sugar and gur : Children 1.5 ounces; Adults 2 ounces.

Water . Six or more glasses.

Assessing the adequacy of diets :

How are we to know that the diet planned is adequate nutritionally? Among the many procedures available for assessing the nutritive value of diets, the simplest one is the "Score Card". Using the dietary allowonces and patterns suggested above, a score card can be developed for determining how well the diet meets the requirements. One such score cord is given below: It will help to check whether or not a person is getting an adequate diet, and will encourage him in the selection of all the essentials of an adequate and varied diet.

A Score Card for Assessing the Adequacy of Diets.

Foods	Minimum amount per day	Score	Your Score
Milk, milk products or groundnut milk	Adults 2 cups Adolescents 3 cups Children 4 cups	20	
Tomatoes or citrus fruits or sprouted gram	2 ounces	10	
Leafy green or yellow Vegetables	4 ounces	15	
Other Vegetables	4 ounces	5	
Fruit	2 ounces	5	
Eggs or nuts	1 egg or 1 ounce	10	
Meat, poultry, fish or dhal or groundnut or curds	2 ounces	15	
Cereals	12 ounces	10	
Fat	1 ounce	5	
Water	6 or more glasses	5	
		100	

For every shortage or wrong habit, the following deductions in the score should be made:

Tea or coffee for children	...	10
Soda or colour drinks	...	10
Eating meals at irregular times	...	10
Eating snacks in between meals	...	10
Eating too fast	...	5
Omitting a meal	...	10

Another method of food composition tables, which can be taken from determining the nutrient content of diets is through the use of "The Nutritive value of Indian Food and the Planing of Satisfactory Diets":— by Indian Council of Research.

Planning Meals:

While planning meals, the points to be considered are, the size of the family, their food preferences, age of the members, their activities, customs, season, locality and the needs for preparing diets for special conditions.

Age, must be considered because the appetites, tastes, growth needs, amount of exercise and food tolerance of children and elderly people differ. A child under three years and a grandmother over eighty years may have to partake of the same meal in the family.

The **occupation** of the members of the family, their work and play should be taken into account while planning meals. Fathers engaged in hard physical labour involving active muscular work such as farming, and other agricultural operations, need more energy than those who sit at an office desk. Mothers working on the farm and those who do heavy work in ihe house while caring for young children, also need extra food energy. Working mothers have the additional problem of planning meals which can be prepared in a short time so that they can manage both the home and the career.

Don't Cook More Than Is Needed

Don't Serve More Than Is Eaten

The **amount of money** available for food is another important consideration. The expenditure for food is the largest single item in expense list for many families. How much of the monthly income is to be allotted for expenditure on food should be decided first, As much as 70—80 per cent of the low incomes may have to be spent on food. The lower the income, the more carefully the meals need to be planned, so as to stretch the rupee spent on food. Low income should not prevent the serving of appetising and nourishing foods within the means. Adequate diets can be provided at different cost levels if economy is practised in the purchase of foods. Many foods high in nutritive value are available at relatively low costs. Foods which are in season and produced locally, being more plentiful, are less expensive.

The **time of the year,** the geographic location of the place and the seasons influence directly appetites for certain foods. Planning of hot foods for cold weather, and cold foods for hot weather is a necessity.

What is a good Menu?

In a good menu, the foods should be combined, should be attractive, pleasing in colour, form, texture and flavour and should give maximum satiety and nutritive value for the money spent.

Preparation of Meals

In the preparation of foods, cooking procedures which help in retention of colour, flavour, form texture and nutritive values should be employed. The following suggestions may be of help in insuring the retention of maximum nutritive value during cooking.

(1) Foods must be prepared carefully prior to cooking, i.e., during soaking, cutting salting, etc. Since most of the vitamin and mineral rich parts of fruits and vegetables lie just beneath the skin, it is desirable to cook with the skins or peel them lightly.

(2) Vegetables should be cut just prior to booking or serving and they must be cut in as big pieces as possible to minimize the surface exposed to air and boiling water.

(3) Accurate measurements and standardised recipes help getting good results and avoiding waste.

(4) Refined foods such as maida. white sugar, suji have lost many nutrients in the process of refinement and for this reason should be used in moderation.

(5) Fresh vegatables should be used in preference to ones which are wilted and stale because the vitamin 'C' contents decreases upon storage.

(6) Minerals, vitamins and colours are lost in soaking long in water. Very little water should be used for soaking and the soaking time should be minimum. When dry foods such as dhal and dry beans are soaked in water before cooking, the water should also be used for cooking. For the same reason, cooking in too much water, and for too long should be avoided as these lead to loss of nutrients. Water in which vegetables are boiled is usually thrown away. Since it contains valuable minerals, it should be used in cooking items like dhal, soup, etc.

(7) Vegetables look better, taste better and have more food values, if they are added to boiling water and cooked for the shortest time—10 to 20 minutes. In the order of cooking the meal, vegetables should be cooked last.

(8) Soda used in the cooking water of vegetable leads to destruction of vitamin B_1 and vitamin C.

(9) Cook, meat, eggs, and other protein foods at low temperature, since protein get hardened at high temperature. Over cooking may also produce toughening ot proteins.

(10) Serve food as soon as they are cooked.

(11) Canned (tinned) and packaged foods should be opened only just before use, and the remaining foods kept in tightly

closed bottles or jars. Keep jams and pickles in a cool place, and use them up as quickly as possible.

(12) Care should be taken to avoid to much stirring, seiving or straining of foods while they are hot, as these will incorporate air through and air destroys vitamin C.

(13) Vegetables once cooked, need not be reheated, if properly stored. Therefore, left-over vegetables must be served in forms which need no re-heating.

(14) All utensils used in food preparation should be kept thoroughly clean. Food handlers should keep themselves scrupulously clean at all times.

Serving Meals

Proper serving of meals is as important as their preparation. Eventhough foods may be cooked applying the best methods of cooking to conserve nutritive value, palatability, attractiveness, flavour and taste, their values may be lost if not properly served.

Cleanliness must be maintained with everything coming into contact with food.

Many of our young men Examined for Military Services are rejected because they are not Healthy Enough.

Many of us are Living on Diets that are not safe for Health and Strength.

We are all Needed in the War Effort. The Home Maker's Place is on the food front. Victory Starts in the Kitchen.

The first duty of the Homemaker is to feed her Family the foods that will make them Strong and Healthy.

The place where food is served must be made beautiful, attractive and comfortable. Only then, it will win immediate and enthusiastic acceptance. This need not mean extra expenditure, because cleanliness and beauty can be obtained inexpensively with a little imagination and effort. Using glamour touches such as cutting out beautiful shapes of vegetables combining colours artistically will certainly make even the ordinary inexpensive dishes beautiful.

A spotless kitchen with smokeless fire place, a clean space with colourful pottery and flowers, greens or rangoli patterns will go a long way to make the meals inviting and appealing.

Variety in shapes and textures as well as in kinds of food is important. Maintenance of food in suitable temperature is essential for appreciating flavour and taste.

The secretion of digestive juices depends on the pleasantness of the environment in which food is served. The atmosphere of the dining place, while serving food must be cordial. When meals are served in peaceful surroundings, and eaten admist enjoyable conversation, with no hurry or strain, appetite is stimulated, and digestion and metabolism are greatly facilitatec.

—o—

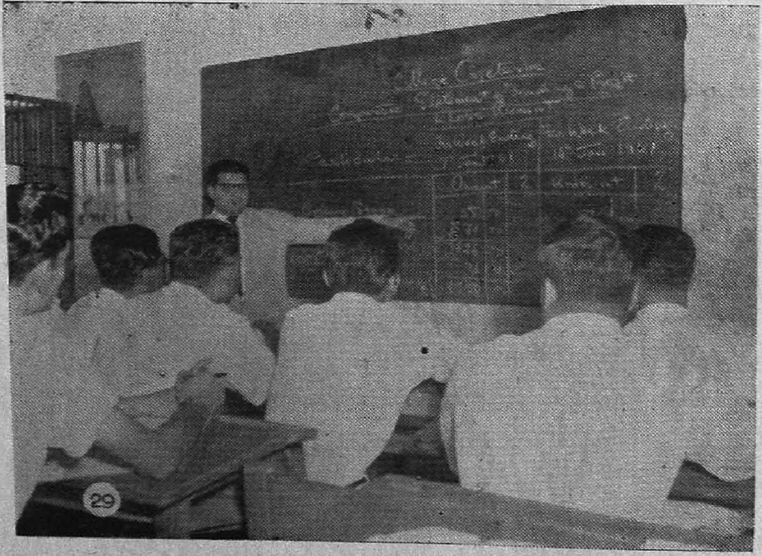
CATERING EDUCATION IN INDIA

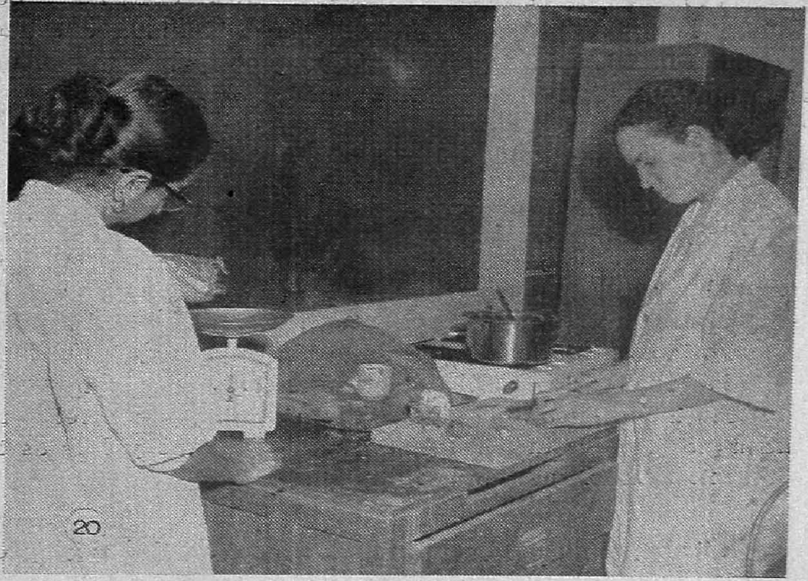
By

Miss. T. E. PHILIP, M. S. (U. S. A.), M. H. C. I.,

(Acting Principal, College of Catering & Institutional Management ; Andheri, Bombay 58.)

IN the olden days a manager of any industry was one who generally worked himself up from the ranks due to his innate ability for leadership coupled with ambition and a certain amount of luck or he inherited the job. The former method was time consuming and difficult and the latter didn't always





make a success of his job. Today we know that management like any other subject can be taught academically as well as technically and the specialised knowledge thus obtained enables a person to eliminate some of the slow processes otherwise involved in learning by trial and error.

Since the common man thinks of food and all aspects connected with food as domestic problems the concept of Catering Technology and the specialised education in this field have taken more time to evolve. Hence this is one of the newest technologies, developed probably in the last 10–15 years and one that is not properly understood by the people generally.

There are many people who even today think that training by apprenticeship is one of the best methods in this field. While training by apprenticeship has tremendous value in supplementing the technical education by application of the knowledge realistically, by itself this method has the same weakness found in any other industry.

3

In the West it has been brought home that the food industry is one of the largest if not the largest industry and that personnel in this industry requires as much technical training as in any other industry. Hence this type of education has taken on a new look and there is a greater demand each day for technically trained people.

This techonology is still in its infancy in India and while there is a great deal of speculation on the subject very few people have a correct understanding of its objectives and scope. I have heard even educated people call it either a finishing school or cooks' school or waiters' school or even a poor relation of a Home Science College. Having been in this field from the inception of this type of education in India I feel more and more strongly the need for educating the public as to what this technology stands for.

In its broad concept catering is defined as the supply of what is required be it food and beverage or the conforts of the bedrooms—in other words this technology is directed towards providing a home away from home for travelling business people, tourists, holiday makers, etc. and to provide food service organisation where wholesome nutritious food hygienically prepared and of a high standard of cuisine are served within a fixed budget to people of all walks of life-school children patients in hospitals, working people, on railways, ships, airlines, etc. Rapid industrialisation and the fact that more and more people live in suburbs and work in cities added to the fact that women have to work alongside with men to meet the economic demands of the time have all made public eating an essential part of our every day living. This is where Catering Technology, while it runs parallel with Home Science differs from it. Home Science is directed to the needs within the home where food and other comforts are provided to a chosen few of similar interests and tastes while Catering Technology is directed to meet the needs of a wide range of people of haterogenous tastes and incomes. Budgeting within a home although necessary is much more flexible while catering outside of home has to be worked out under a more rigid budget

varying perhaps, in schools, hospitals and industrial canteens from a no profit no loss basis to profit making concerns such as commercial restaurants and hotels. Thus *training in* Catering Technology is professional and technical and training in Home Science is domestic. Portion control, cost accounting and standardisation of receipees and food are a must in catering technology. *To attain its objectives the technology must* include instruction in the proper techniques of purchasing and storage—When, how, how much, for how long and at what temperature—techniques and skill in preparation of food *palatable, nutritious, without waste while obeying all the* principles of food hygiene, and attractive service of food where customer satisfaction is the chief *criterion.*

Another fundamental *difference between Home Science &* Catering Technology is in the approach of the two subjects. Where as Home Science has an academic approach and the practicals taught are aimed at supporting the theory. Catering Technology has a definite practical approach and the theory taught alongside such as Nutrition, Basic Science, Hygiene, etc. are all directed to do the practical work with a better understanding and in a more standardised way.

The *College* of *Catering & Institutional* Management in Bombay, the first of its kind in South East of Asia, was founded in 1954 and has done pioneering work in India. Successful training done at this Institution has brought recognition not only by the State Government but nationally. Many more colleges of this type will soon be opened all over India, the college at Delhi being the second.

The full time Course of the College is aimed at training for management. The subjects taught in the full time Course—Course aimed at training for management through the Crafts—are Cookery and Bakery—basic in the first year, quantity in the second year and specialised in the third year—*Nutrition*. Basic Science, Hygiene, Food Commodities, First-Aid, Restaurant and Counter Service, House Keeping, Reception, Calculations and Book-Keeping, English, French, Catering Management,

Nature of Management and Organization and Management. All the full time students have to take Craftsmanship Courses in Waiting and Reception and Book-Keeping during their training.

Employment prospects for the graduates of the college are excellent – the demand from the industry being greater than the number of graduates. The ex-students of the college are satisfactorily employed in key positions in hotels such as Taj Mahal, Ambassador, Ritz, Ashoka, etc. in industrial canteens such as Rourkela Steel Works, Heavy Electricals, Bhopal, in hospitals as dietitians, on Railways, Airlines, Shipping Companies and in Extension work.

Besides the full time Course the College runs Craft Courses in Trade Bakery, Trade Cookery, Waiting and Reception & Book-Keeping. A popular Course is the Housewives' part-time Course in Cookery, Bakery and in Canning & Food preservation. A twenty one weeks' Refresher Course in Elementary Management for catering personnel in the trade is greatly appreciated and has helped the industry – Airlines, Shipping Companies, Railways, Industrial Canteens and even private hotels have availed themselves of this Course.

"GUNS OR BUTTER" WAS A SUBJECT OF RAGING CONTROVERSY IN THE YEARS BEFORE THE WAR. BUT EXPERIENCE HAS PROVED THAT BUTTER AND ALL THAT IT STANDS FOR IN RESPECT OF NOURISHING FOOD PLAYS AN INTEGRAL PART IN THE BUILDING UP OF MUNITIONS FOR WAR. AND WHAT CAN BE THE TRUER THAN THIS THAT ONLY A WELL FED NATION CAN SUCCESSFULLY FIGHT FOR PEACE.

NUTRITION FOR A CHILD IN HEALTH AND DISEASE

Dr. GOMATHI VENKATARAMAN, M. B., B. S., D. C. H.

and

Dr. KHAIR BOKHARI, M. B., B. S., D. C. H.

THE aim of adequate nutrition of a healthy child is to have a happy growing child. For this the diet should not only be *just adequate to maintain* the various physiological processes but should provide for maintaining these processes at their very best and also to provide for satisfactory growth during the various stages of childhood. Therefore, before considering adequate nutrition in health it will be worth while knowing some facts on the variations in the different stages of a healthy child. Growth is at a rapid rate from birth to the age of 12–18 months. It slows down thereafter to a steady until the age of 10–12 years. This factor is very important not only in planning a good diet, but also for mothers who get unduly worried with their children not eating enough after the age of one year or so

The nutritive needs of a child are as follows :—

Calories : 45–50 Kgm. body weight during infancy less there after corresponding to the slower rate of growth.

Proteins : 2 Gms. / Kg. weight.

Carbohydrate : Enough to produce calories.

Fats : Exact amount not calculated but diet should contain adequate amounts of the essential fatty acids.

Vitamin A : 1500 units / day

Vitamin B_1: 0.3 mgm./day

Riboflavin: 0.4 mgm./day

Vitamin C : 30 mgm/day

Vitamin D : 400 I. V./day

Calcium : 600 mgm/day

Iron : 5 mgm/day

Phosphorous : Exact amount not calculated, usually enough in a diet which is otherwise adequate.

Fluids : $2\frac{1}{2}$ oz. /lb. body weight plus amount lost as sweat is of significance in tropical countries.

Knowing the amounts of the various nutrients required one should know the diet which will supply all these to a child.

For a normal healthy infant till the first 6 months of life all the above mentioned nutrients are supplied in breast milk—consequently the ideal diet at this stage is breast milk. Every attempt should be made therefore to encourage and maintain breast feeding specially in a country like ours of low social economic status, where artificial feeding is too tedious and expensive. In condition where breast feeding is just not practicable owing to valid reasons, resort should be made to artificial or mixed feeds. For this *purpose* cow's *milk* either fresh or dried milk can be used. In view of the lower fat tolerance of the infants in tropics half strength dilution of cow's milk with 5% sugar i.e. 1 teaspoon to every 3 ounces of milk provides a good diet.

After 6 Months :

In view of the decreasing iron reserve, and the increasing demand of iron, Vit. C and Folic acid, it becomes *necessary to introduce substances* other than milk. Also a purely milk diet is too bulky for the child's system, if it has to provide all the requisite nutrients. The iron requirements after the age of 6 months can be easily provided by introducing gradually *increasing amounts of cereals* such as rich gruel and ragi (common in the south) or suji (Rava) porridge (common in the North). Besides this vegetables in the form of Soups and *later* boiled vegetables as such provide Vitamins of the B.

Group and Folic Acid. Vitamin C at this stage has to be provided in the form of orange juice or fresh lime or tomato juice.

Simultaneous with the introduction of these food stuffs is the gradual withdrawal of breast feeding, the process being known as weaning. By the end of 1 year the infant which has been properly fed and weaned is ready to share the normal diet of the adult members of the family which differs with various parts of the country. Whatever the food stuff may be, an adequate diet from this time onwards should contain balanced amounts of cereals, pulses, vegetables leafy and non-leafy, fruits at least 1 ounce of milk a day, sugar, fat and 1 egg a day. The exact daily amounts of these have not been calculated, but in an older child as in an adult they are :—

Cereals	14 oz.
Pluses	2.3 oz.
Leafy Vegetables	4 oz.
Roots	3 oz.
Other Vegetables	3 oz
Fruits	3 oz.
Milk	10 oz.
Sugar	2 oz.
Vegetable oil or ghee	2 oz.
Fish or meat	3 oz.
Egg	1

In view of the socioeconomic status of our country cheaper sources of proteins e. g. Bengal gram, ground nuts and the like are suggested to replace milk. In costal regions fish is a fairly cheap and good substitute to provide adequate proteins of animal origin so much for nutrition in health.

Coming to the question of *nutrition* in diseases one must just consider the common diseases of childhood in our country

which call for modified nutrition. These are by far common in infancy and pre-school age i e. till the age of 5 years and are as follows ;—

Infancy :—

1. Prematurity Acute, Chronic
2. Diarrhoea Acute, Chronic
3. Marasmus
4. Protein Malnutrition

Childhood 2, 3, and 4

5. Infections of Castro Intestinal tract
6. General affictions like Renal conditions (Nephrosis) and rarely errors of metabolism,

Other rare cases are ana nalies of the Gastro Intestinal tract which though not involving nutrition as such call for a modified technique of feeding

Prematurity: Breast milk is the ideal milk that has to be given as far as practicable. Otherwise half strength cow's milk with 10% sugar or half cream dried milk is well tolerated. In view of the rapid rate of growth extra amounts of Vit. D 800 mls. a day are needed. Vit. C. though not needed in surplus quantities has to be started at the age of 1 month preferably given as ascorbic acid as fruit juices are well tolerated here. Iron has to be started at the age of 10—12 weeks as the iron stores are small

Calories required are 60—70 lb. weight from the 3rd week.

Acute Diarrhoeas: If child is in a moribund state the maintenance of nutrition is by parental means. In less serious cases and after the initial stage of electralyle imbalance has been over come it is advisable to keep the child on a starvation diet for 12—24 hours and never more than 48 hours. Such a diet can be improved by Barely or Arrowroot water (3%) rice water sweetened with saccharine. Carrot soup and apple, tea diet though very good are not suitable in our country in view of the low socio—economic status.

After the period of starvation diet it is necessary to put the child gradually on a therapeutic diet *consisting of skimmed milk* with lactic acid and similar dried milk prepartion. The transition should be *gradual replacing one feed* at a time. Once this is well tolerated gradual transition to the normal diet of the child can be done again one feed being replaced at a time. A therapeutic diet should never be continued for more than 4—6 weeks. *During this periods* extra vitamins *have to be provided* to the child specially those of the B. Complex group. Vitamin C which is poorly absorbed during the acutest age and also because of the effect of antibiotics on the gastro intestinal tract bacterial *flora* there is *inadequate synthesis of B. Complex* group of Vitamins.

Chronic diarrhoea : not necessary to put the child on a starvation diet A therapeutic diet is well tolerated, the bulk should be more to compensate for decreased absorption. Extra vitamins are required.

Marasmus : Apart from treating the cause, nutrition is an important step of management. Skimmed milk with 10% sugar and extra vitamins is required.

Protein malnutrition : High Protein diet with proteins as much as 5-6 gms/Kg. wt. have been suggested but in practice smaller *amounts prove satisfactory* enough. *Skimmed milk is below* tolerated later on. Egg, fish and other protein rich stuffs can be introduced. Extra vitamins and iron are necessary. *Cheaper* sources of protein such as ground nut, *Bengal gram* have been suggested to replace milk as it is a disease of the poor.

Infections of the Gastro Intestinal tract : Extra vitamins have to be provided with the normal diet. Low fat milks are better tolerated.

Metabolic errors : Special diets depending upon the metabolic involved.

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NATIONS ARE BORN OUT OF NURSERIES.
IN THEIR TINY HANDS.
CHILDREN HOLD THE DESTINY OF THE YEARS
TO COME. Kingsley.

Biochemical Manifestations of Gammexane Intoxication

By

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GAMMEXANE is an insecticide like D. D. T. and is quite familiar to the common man though it does not enjoy the status of D. D. T. in the Public Health Department. It is mainly used to exterminate bugs. The biochemical effects of Gammexane intoxication have been studied in albino rats and in the larvae of *Corcyra Cephalonica Strain* (rice moth larvae) in the department of Biochemistry, Madurai Medical College, Madurai.

Gammexane is the gamma isomer of hexa-chloro cyclohexane also represented as BHC (Gamma Benzene Hexa Chloride). It has the molecular formula C_6 H_6 Cl_6. As there are 6 atoms each of Carbon, Hydrogen and Chlorine it is commercially known as 666. It is a white powdery substance, insoluble in water but soluble in organic solvents like Chloroform.

Gammexane is toxic to rats and higher animals. Doisy and Bocklage (1949) have shown that it is toxic to rats at a dosage of 40—80 mg % in the diet. Pathologically, liver damage is the most prominent feature in animals and human subjects poisoned with gammexane (Report to the Council on Pharmacy and Chemistry, 1951). Figure 1 is the microphotograph of the liver section of albino rat with chronic gammexane poisoning. Necrosis of the liver cells can be seen when compared with the

10 DEC 1964

micro- photograph of a section of normal rat liver (Figure 2).

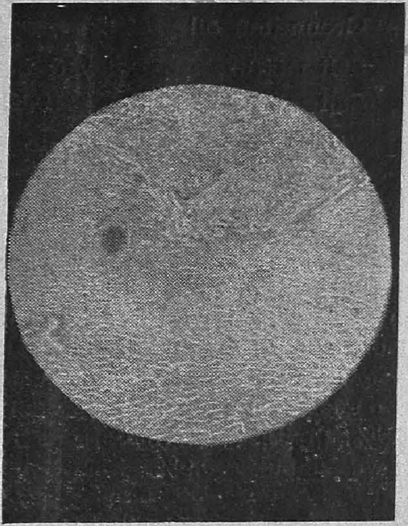

Figure 1

Gammexane and lipid metabolism

As early as 1950, Sarma found that Gammexane poisoning increased the Cholesterol content of the tissue of rice moth larvae. Further work on the biochemical relation between gammexane and cholesterol which is a derived lipid was done in the Department of Biochemistry, Madurai Medical College by Rajalakshmi et al, (1960). It was found that there was an increase in Cholesterol levels in the blood serum of albino rats on chronic gammexane intoxication. For these experiments albino rats with an initial weight of 60+70 gm were divided into 2 groups of 8 rats each and housed in separate cages. Group 1 rats were the controls and received the basal diet of the following com. position :

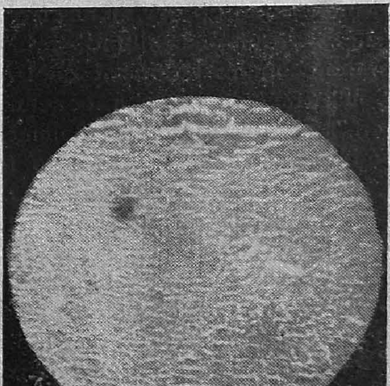

Figure 2

Casein de-vitaminised	... ...	12%
Groundnut oil	... ...	8%
Salt mixture A } Doisy & Bockloge	...	2%
Salt mixture B } 1949	...	2%
Vit. B. Complex (do)	...	1%
Fat soluble vitamin	... ...	2%
Sucrose	... ...	72.6% and
Choline	... .	0.4%

Group 2 rats received Basal diet with 100 mgs % Gammexane in the diet. At the end of 4th week the animals ware sacrificed and serum cholesterol was estimated. It was found that while the cholesterol content in serum of control rats was about 116.5%, that in the serum of rats receiving gammexane in the diet was about 200.9%.

Sarma's observation that Gammexane feeding increases the tissue cholesterol in rice moth larvae has been confirmed.

In addition, the following interesting observations also were made. In both cases, i.e., serum of albino rats and tissue of the rice moth larvae, the accummulation of cholesterol was in the "free cholesterol" fraction with a concomitant decrease in "ester fraction" showing that Gammexane poisoning increases the "free cholesterol". It was also found that in both the cases, if Inositol (one of the members of the Vitamin B Complex) was given in excess in the diet, the cholesterol levels were normal thereby correcting the accummulation of cholesterol in the serum of rats and larvae of *Corcyra Cephalonica* St. As thus Inositol counteracts the effects of gammexane *in vivo*, Gammexane is considered to cause the accummulation of cholesterol not by it direct influence on this lipid but by bringing about a deficiency of Inositol in the Organism. In fact, it is established that gammexane brings about inositol deficiency, as it is an antimetabolite of Inisitol. Whereas gammexane is hexa chloro cyclo hexane, Inositol is hexa hydroxy cyclo hexane. By biological antagonism, gammexane functions as an anti-vitamin

to inositol. Gavin and McHenry noted that inositol prevented accummulation of fat and cholesterol in the liver of rats and were confirmed by several workers. Thus Inositol is a lipotropic factor. That is why a deficiency of Inositol brought about by gammexane manifests in an accummulation of Cholesterol in the serum of rats and the tissue of rice moth larvae. However, Inositol is not a good anti-dote for gammexane poisoning. Because according to Doisy and Bocklage, in their experiments on rats the toxic sympatamatology of gammexane was not reversed by Inosital.

II. Gammexane and Enzyme systems:

In addition to its influence on lipid metabolism, Gammexane intoxication effects an impotant respiratory enzyme system of the liver of rats. It inhibits to the extent of about 55%, the activity of the flavoprotein enzyme, (Riboflavin) (Vitamin B2) containing enzyme) Xanthine Oxidase of rat liver (Ramakrishnan et al. 1961). For these experiments, albino rats weighing 70 $\pm$ 10 gm were grouped into two groups of 8 rats each. Group 1 rats which were the controls had the basal diet which contained the following :

(1)	Casein (de-vitaminised by repeated washing with rectified spirit)	... 21%
(2)	Sucrose	... 65%
(3)	Arachis Oil	... 7%
(4)	Salt mixture (Dalgiesh '52)	... 4%
(5)	Vitamin mixture (Burch etal 56) without inositol but with 30 mg % of riboflavin	... 1%
(6)	Cod liver oil	... 2%

Group 2 rats received the basal diet with 80 mgs % of Gammexane. At the end of 6 weeks, they were sacrificed and the enzymes, Xanthine oxidase, and D Amino acid Oxidase were estimated in the liver.

Rats which received Gammexane had very poor growth rate. They also exhibited hypersensitivity and hyper irritability.

Xanthine oxidase is an important flavo-protein enzyme engaged in cellular respiration (tissue Oxidation) as carrier (either direct or indirect) of Hydrogen during biological Oxidation-reduction re. actions. Moreover its activity is very much dependent on dietary protein (Ramakrishnan et al., 1961) Inhibition of the activity of such an enzyme is really significant. Perhaps this is one reason why the toxic effect of gammexane in vivo is not counteracted by Inositol, as respiratory enzyme system is affected. It was actually found that addition of excess of inositol given with gammexane in the diet to rats for a period of 4 weeks did not reverse the inhibition.

Moreover as Xanthine Oxidase is a riboflavin-(*Vitamin* B2) containind enzyme, it was suspected whether gammexane had brought about a deficiency of riboflavin and thereby affected the Xanthine Oxidase activity. But increased amounts of riboflavin given along with gammexane to rats for about 4 weeks did not correct the inhibition. So it was not due to any vitamin B2 deficiency.

One interesting point worth noting is that whereas hepatic Xanthine Oxidase activity was inbibited, hepatic D amino acid Oxidase activity (twin brother (:) or Xanthine Oxidase) was not affected. Of the two, the former is much more dependent on dietary wheras the latter is on dietary riboflavin (Ramakrishan et al 1961). So whether Gammexane affects protein metabolism and thereby affects the protein dependent enzyme Xanthine Oxidase or it affects Xanthine Oxidase *per se* deserves investigation.

It was however found that the inbibition of hepatic Xanthine Oxidase activity was not due to the "necrosed" condition of liver cells as the inhabition was also found in livers of Gammexane-intoxicated rats which had either conjestion of sinusoids or cloudy swelling of cell chords.

SUMMARY

(1) Pathologically, Gammexane intoxication produced necrosis of the liver cells in a majority of rats, conjestion of

sinusoids in some and cloudy swelling of cell chords in some others.

(2) Gammexane influences lipid metabolism by bringing about Inositol deficiency. It causes accumulation of Cholesterol in the blood serum of albino rats and the tissue of rice moth larvae. The increase is found to be in "free cholesterol" fraction with a concomitant decrease in "ester cholesterol" fraction. Increased amounts of Inositol in the diet counteracted the effect of Gammexane.

(3) Gammexane also caused an inhibition to about 55% of the flavo-protein enzyme Xanthine Oxidase of liver which is mainly dependent on dietary protein. Increased riboflavin or Inositol in the diet did not reverse the inhibition. The other important flavin enzyme, D amino acid Oxidase was not affected. The inhibition is not found to be due to necrosed condition of liver. It may be the influence of Gammexane on the enzyme *per se* or via protein metabolism.

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THE FOOD DESTROYERS-INSECTS AND OTHER PESTS. RAVAGE CROPS THAT COULD FEED UNTOLD MILLIONS OF PEOPLE

COCKROACH IS A SERIOUS PEST WITH HOUSE INVADING HABITS. FOUND EVERYWHERE IT FEEDS ON ALL SORTS OF THINGS IN A HOUSE, CONTAMINATES FOOD AND HAS AN UNPLEASANT ODOUR.

FOOD

Is a Munition of War

Don't Waste It.

Nutrition in Pregnancy

By

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INTRODUCTION :

THE nutritional state of the mother previous to, and during pregnancy is of great importance to her health and to that of foetus. The old belief that the developing foetus takes everything it needs from mother unlimitedly and irrespective of her nutritional status is now said to be false. (Burke) The foetus is parasitic on the mother to a degree which depends on her own nutritional state and diet during pregnancy. Research data repeatedly indicates that if the mother is sufficiently depleted nutritionally; the foetus may suffer, to spare her. Animal experiments also support this view. Hence greater attention to the content of the diet, benefits both mother and child together, and the mother primarily. Deficiency in the maternal diet

predisposes to diseases in both mother and child. Animal experiments suggest that there may be a relationship between congenital anamolies in the new born and dietic deficiency in the mother. *Woodroff's studies suggest that in Africa the infant* victims of Kwashiokar are due partly to deficiency of maternal protein. Similarly the incidence of still-births, neo-natal deaths prematurity and immaturity are higher in the poorer diet group. In the mother sub-standard diet-predisposes to anaemias-oedema and other deficiency diseases, complicating pregnancy.

Calorific requirements :

The calorific requirements during pregnancy range from 1,800 to 2500 calories according to various authors. The modern trend is to adjust the calories so as to produce an increase of weight of 18 to 21 lbs. over the non-pregnant state. In olden days the trend was to give a high calorific diet because of the increased metabolism during pregnancy. But this increased B.M.R. is largely neutralized by inactivity, so that no great increase in calories is necessary. Some clinicians indeed advocate restriction of calories to about 1,800 daily to prevent excessive weight gain and this help in preventing toxamia (as there is evidence that obesity predisposes to hypertension.) This weight restriction is accomplished by giving a high protein diet and cutting down the carbohydrates. Excessive weight gain in pregnancy leads to many complications. Hence it is very essential to restrict the weight gained to 18 to 21 lbs.

General character of diet :

Diet in pregnancy should include an ample amount of green vegetables brown cereals, meat, fish and milk. There should be a minimum daily in take of 1 pt. of milk (as this is the best way of supplying calcium.) one serving of meat, fish, one egg, rice bread or wheat and fresh fruit and vegetables. This type of mixed diet is essential.

Protein :

The pregnant women differs from others in her requirements of protein. She requires more protein because of the

added demands of pregnancy particularly in the third trimester. The increased metabolism, foetal growth and repair growth of the uterus, increased blood volume and development of mammary tissue require added protein. Hence 85 gram. equivalent of protein are required for the pregnant woman, and 100 grams. for the lactating women as compared to 60 grms. in the non-pregnanty state. Of these, two thirds must be in the form of animal proteins, such as meat, eggs, cheese, poultry and fish and one thirds vegetable protein such as beans, peas and cereals. Deficiency of protein is a cause of anaemia, probably of the dimorphic variety and may have a bearing on certain other manifestations like toxeamia, odeoma and prematurity.

Minerals :

Thirteen or more minerals elements are essential for human nutrition. Of these, calcium phosperous iron and iodine are more important as also sodium and potasium.

Calcium :

The calcium content of the foetus is 25 grams at term. To prevent calcium depletion the mother requires 1.5 gram daily as compared to 0. 68 gram in the non-pregnant state.

It was thought that all the calcium could be got by injestion of large quantities of milk (1 quart of milk contains 1. 25 gram of di-calciumphosphate) But recent experiments suggest that excessive quantities of dicalciumphosphate depress the ionised calcium of the blood and produce tetany and leg cramps. So the milk must be supplemented with calcium gluconate, or by adding alumunium hydroxide gel to the diet by which excess of phosphorous ions can be removed from the diet.

Effects of Deficiency :

Calcium deficiency with super added Vitamin D deficiency predisposes to osteomalacia. It has also been suggested that calcium deficiency may cause other abnomalities like prematurity, uterine inertia, Post partum Haemorrhage Preclampsia

and Eclampsia. But the evidence is not conclusive. In the child deficiency of calcium and Vitamin D predisposes to rickets and dental caries.

Iron.

The full time foetus stores 400 mgs. of iron. The maternal body stores 500 mgs. of iron during pregnancy in the hyper-trophid uterus. Two thirds of this is laid down in the last two months. The necessary daily intake of iron to prevent a negative balance is 15 to 25 Deficiency of iron causes anaemia in the mother which is the commonest complication of pregnancy much worsened in the third trimester. Anaemia in the child most commonly manifests itself in the first year.

Diet alone cannot supply iron to meet the demands of pregnancy. So it is necessary to supplement the iron in the diet by giving iron in the form of ferrons salts in a daily dose of 3 grains three times a day. The hydraemia of pregnancy has now been proved to be a myth and only a mild manifestation of iron deficiency. In the more advanced and richer countries iron deficiency in minor degree in pregnancy is fairly common though nutritional oedema is unknown.

Iodine

About 1 mg of iodine is required daily. Sea fish contains iodine. If this is not available, the diet can be supplemented by fish liver oil. Simple goitre may occur in women with repeated pregnancies due to iodine deficiency.

Sodium chloride

There is a tendency to restrict salt in pregnancy especially in women who tend to develop oedema and toxaemia.

Vitamins

Vitamin A is essential for building up and maintaining bone structure. It is also essential for the maintenance of body resistence to infections. This is important as there is the danger of intercurrent infection during pregnancy labour and puerperium. This is to be most jealoualy guarded against. Milk and dietary

products with butter fat, green leafy vegetables and fruits and carrots are rich in Vitamin A. and carotene 5,000 to 10,000 International units are required daily in pregnancy.

Vitmain B. Complex

It includes various items like B_1. B_2. Nicotinic acid, B_6 etc, B_1 is the antineuritic vitamin and deficiency of B_1 leads to polyneurites with fatal outcome. Riboflavine is essential for formation of an enzyne utilized in tissue oxidiation. Nicotinic acid prevents pellagra. These are contained in natural foods like meat, milk, eggs and green vegetables.

Effects of deficiency.

Conditions like pyloric obstructions, bleeding tendency in babies, anaemia, atrophy of ovaries, and a high incidence of Post partum haemorrhage have been ascribed to Vitamin B. Complex deficiency. WERNICKES ENCEPHALOPATHY in Hyperemesis Gravidarum is a classical example. Harell and his associates (Metabolisim 5:555. 1958) found that the mean intelligence of children determined by conventional testing methods at 3 and 4 years were significantly higher in those whose mothers received vitamin supplements during the later months of pregnancy, than in those whose mothers received an inert control tablet. Benefits were most apparent in the group receiving a supplement of thiamine, riboflavine, niacinamide, and iron.

Vitamin-C.

Or ascorbic acid, (the absence of which results in scurvy) is essential for the development of the off spring. It is required for the metabolism of iron. There is a tendency for reserve deficiency of vitamin C. in pregnancy. An adequate level can be maintained by supplementing the diet with fresh citrus fruits (like oranges) and tomatoes

Vitamin-D

The antirachitic viamin is essential during pregnancy. It controls absorption and utilization of calcium and phospherous. Hence it is essential for the prevention of rickets. Egg yolk is

rich in Vitamin-D and the diet can be supplemented with fish liver oil. 400 to 800 international units are required daily.

Vitamin—E

Is found in wheat germ, and green vegetables. It is essential for reproduction as the development of the embryo depends on it. It is also essential to the new born and suckling child.

Vitamin—K

Known as Coagulation vitamin is found in milk, meat, and green vegetables. It is necessary for the formation of prothrombin which is one of the factors necessary for the clothing of blood. It is claimed that by giving vitamin K during the last weeks of pregnancy, and during labour, the prothrombin content of the foetus is raised, and the incidence of haemorrhage in the new born can be reduced. This is of special importance in premature babies.

The above is a broad outline of the nutritional requirements of pregnancy.

Conclusion

But the practical and intelligent approach to achieve and maintain a good nutritional status for the pregnant woman requires motiviation and understanding on her part, and interest by the Physician. This begins with an estimate of her previous nutritional state and dietary habits. A dietary chart adjusted to individual needs is very important, Special efforts should be made to secure the protein nuclues of foods. It is essential that the diet for normal pregnancy should be altered to meet the complications of pregnancy,

The following is a guide to daily diet in pregnancy by Malla by

2 Pints of milk

1 or 2 servings of green leafy vegetables like cabbage.

1 or 2 eggs.

One fresh fruit like apple or orange.

Sea fish twice a week.

Liver once a week.

Two teaspoons of codliver oil daily.

This may be supplemented with iron in the form ferrous salts three grains thrice a day folic acid—5 mgms. daily Calcium gluconate talbets may be added if sufficient milk is not within the reach of the patient.

There is a Famous Chinese Proverb, "If you are Planning for a year, Plant Grain; if you are Planning for Ten Years, Plant Trees-If you are Planning for a 100 Years Plant Men. " Thus, in order to have strong Men and Women in the Future Free India, Special Attention should be paid to the Diet of Vulnerable Groups—viz; Toddlers, Expectant and Nursing Mothers, School Children, Convalescent and Manual and Industrial Workers of these priority shouid be given to the Nutrition of the Expectant and Nursing Mother."

The Present Position Regarding Protein-Rich Processed Foods for the Supplementary Feeding of the Vulnerable Groups of Population

By

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DIET surveys carried out in different parts of India, have shown, that the dietary of large segments of the populations is mainly based on cereals and starchy roots and contains little or negligible amounts of protein-rich and protective foods like, milk, meat, fish, eggs etc. Such diets have been found deficient in proteins, calcium, vitamins A and a few members of the B-complex. The problem of supplying adequate nutrition to the infants and children has also become very acute, as the *per capita* production of milk in the country is very low. Because of the undernourished condition of the mother, the infant is very often deprived of adequate supply of mother's milk. The need for supplementary foods like cow's or buffalo milk becomes greater as the infant advances in age. Due to the scarcity and high cost of milk and other protective foods, the children of the poorer classes are generally fed on cooked cereals or cereal gruels, both of which have low protein contents and are deficient in certain vitamins and minerals The incidence of under-nutrition, protein malnutrition and vitamin deficiency diseases is consequently quite high among the vulnerable groups of the population, especially belonging to the poorer classes. There is an urgent need for large scale production, at reasonable cost of nutritious supplementary foods

based on locally available protein-rich foods and fortified with essential vitamins and minerals'.

The most important and abundant sources of proteins, available in many of the developing countries, are mainly of vegetable origin. These include the low-fat oil seed meals from oil seeds and nuts such as groudnuts, soya bean, coconut etc. and legumes such as grams, beans etc. The production of major oil seeds and legumes in India as compared to different regions of the world and some selected countries is given in Table I. Considerable interest has been evinced during recent years in many countries in the utilization of specially processed low-fat oilseed meals and legume flours as protein supplements, in human dietary. A brief account of investigations carried out at the Central Food Technologica- Research Institute, Mysore on processed protein foods, suitable for supplementing the diets of vulnerable groups of the populal tion is presented in this paper.

Processed protein foods based on blends of oil seed meals, legume flours, and/or fish flour.

Researches carried out at the Central Food Technological Research Institute, during the last five years have been directed to the development and evaluation of processed protein foods, from blends of oilseed meals. legume flours and/or fish flour, suitable for supplementing the diet of older children and other vulnerable groups of the population. The chemical composition of the different foods is given in Table 2. Many of these processed protein foods, developed, standardized and evaluated contain fairly large amounts of groundnut flour, as one of their constituents. Groundnut flour, from kernels, infected with *Aspergillus flavus* has been reported to be toxic to turkeys. Groundnuts as harvested in India, and under prevailing conditions have seldom been found so infected and furthermore in the process as adopted for groundnut flour production, all spoilt kernels are removed, and hence the groundnut flour (edible quality) will be free from such toxic substances. So far, a few millions pounds of groundnut flour have been produced both at the Institute, and a private firm at Coimbatore, and utilised in

processed formulations used in various feeding programmes, without a single instance of toxicity. A brief account of the work on the different processed protein foods, follows:

Multipurpose food (M.P.F.)

This is a 3 : 1 blend of low-fat groundnut flour and Bengal gram flour, fortified with vitamins A & D. thiamine and riboflavin ane calcium salts. Three formulations have been developed: a) seasoned (b) unseasoned and (c) unseasoned with 20 per cent added skim-milk solids. Extensive investigations carried out on albino rats have shown that M.P.F. at 12.5% level supplements to a significant extent poor Indian diets based on different cereals. The proteins of M.P.F. possess a fairly high nutritive value, and are quite effective in meeting the protein requirements of protein depleted rats, when fed at 14% level of protein intake. A feeding trial, extending over a period of 5 months showed that supplementation of the diet of school children daily with 2 ozs. of M.P.F. brought about a highly significan improvement in their height, weight, R.B.C. count, haemoglobin and nutritional status as compared to the control group, not receiving the supplement (Table 3). The children, receiving the supplement of M.P.F. also retained significantly larger amounts of nitrogen. colcium and phosphorus than the control children

M.P.F. (formula C) containing 20 per cent skim milk solids has been found to be an effective supplement to the diet of weaned children (Table 4). The food has also been found quite effective in the treatment of kwashiorkor in children; this aspect, however, will be dealt in a later section

A commercial unit for the production of M.P.F. with a rated capacity of 4 to 5 tons per day (16 working hours) is at present functioning at Coimbatore, S. India. A major part of the production from the plant is being made available to the Madras Government for use in the mid-day meal programme for school children. The Ministry of Food & Agriculture. Government of India has plans to set up units for the manufacture of M.P.F. at different centres in India for use in mid-day school feeding programmes.

Protein foods containing coconut meal :

Coconut meal contains a fairly high percentage of fibre (10–12%) which precludes its use as a sole protein supplement. The possibility of using coconut meal to the extent of 25 per cent in processed protein food formulations has been shown. A processed protein food consisting of a 1:1:2 blend of coconut meal, Bengal gram flour and groundnut flour and fortified with calcium salts, vitamins A & D, thiamine and riboflavin was found to possess a marked supplementary value to poor Indian diets, when incorporated at 12.5% level, as judged by growth studies on albino rats. Supplementation of the diets of children (aged 4–12 years) over a period of 8 months, with 2 ozs. of protein food daily brought about highly significant increases in height, weight, R.B.C. count and haemoglobin levels, as well as improvement in nutritional status, as compared with the control group, not receiving the supplement (Table 3).

A process, developed by Krauss Maffei, West Germany has been in operation of the Institute for the rendering of coconut for the oil and protein. The process consists of the following steps : (i) autoclaving of dehusked coconuts and removal of the shell from the kernel by cracking (ii) cutting or rasping the kernel (iii) extraction of water and oil emulsion in a screw press (iv) centrifugal separation of the oil from the aqueous phase (v) coagulation of the protein from the aqueous phase and recovery by centrifugation and (vi) concentration of deproteinised water to give coconut honey. On the basis of work in progress at the Institute, on the utilizsation of coconut protein, the original process has been somewhat modified. The aqueous phase, obtained by the centrifugal separation of oil from the emulsion (coconut milk) instead of being processed for the protein, is concentrated as such in a vacuum evaporator to obtain coconut honey rich in proteins (28% on dry solid basis). There are vast possibilities of using cocount honey, which contains the coconut sugars and protein, without any fibre in the preparation of processed formulations for the supplementary feeding of infants and weaned children ; this will be reviewed in a later section.

Protein food based on a blend of groundnut flour and skim milk powder

This consists of a 4 : 1 blend of groundnut flour and skim milk powder, fortified with vitamins and minerals. The protein food is prepared by blending the required amounts of groundnut flour and skim milk powder and fortifying with calcium salts, and vitamins A, D, thiamine and riboflavin. The food, when incorporated at a level to provide 5% extra protein, in poor rice diet, showed a significant supplementary effect, as judged by the growth of albino rats, comparable to that of skim-milk powder. The proteins of the food possess a fairty high nutritive value. A feeding trial extending over a period of 3 months on weaned children showed that supplementation of their diets with 40g. daily of the protein food brought about highly significant improvements in their height, weight and haemoglobin content as compared to the control group not receiving the supplement. (Table 4).

Fish flour and protein food containing fish flour

Another product to which FAO has drawn the attention of nutrition workers and governmental authorities is flavourless edible fish flour. For the purpose of child and infant feeding, a cheap fish flour seems to offer great advantages with regard to price, keeping quality etc., in comparison with canned fish or dried and salted fish products. Fish flours are very rich sources of high class protein, essential minerals like calcium and vitamin B_{12} and as such will effectively supplement the diets of weaned infants, school children and also expectant and nursing mothers. Much work has been done on the preparation of and supplementary feeding with flavourless fish flours and fish flour autolysates in South America and Western Africa, which yielded encouraging results. In some instances fish flour was also introduced in the diet of patients, recovering from kwashiorkor, with very good results. In Uganda, fish meals were tried as supplementary food for children and expectant and nursing mothers and was accepted by all. The fish meals can be incorporated in bread, soups and sauces to which it gives a pleasant taste, making them more appetising.

A process for the preparation of edible fish flour from oil sardine has been standardised. The fish flour supplements to a significant extent poor cereal diets even at as low levels as 3 per cent. The proteins of fish flour possess a high protein efficiency ratio and significantly supplement those of oil seed meals and pulse flour.

A processed protein food based on a 2:1:1 blend of groundnut flour, Bengalgram flour and fish flour (from oil sardine) and adequately fortified with vitamins and minerals has been prepared. A feeding trial carried out at a local boarding home in Mysore, has shown that supplementing the diet of school children (boys, aged 4—12 year) daily, with 40 g. of this protein food resulted in significant increases in their height, weight, R. B. C, count and haemoglobin content, as well as improvement in nutritional status, as compared to the control group, not receiving the supplement. (Table 3).

Processed foods suitable for the supplementary feeding of weaned children

A number of processed protein foods suitable for the supplementary feeding of weaned children have been developed; the most promising are (i) Balanced malt foods (ii) Enriched macaroni products and (iii) Roller-dried protein foods based on blends of cereal flours, oil-seed meals and legume flours. The chemical composition of the foods is given in Table 2.

Balanced malt foods

Investigations carried out by Chick and Slack and Dean have shown that a highly nutritious food can be prepared by blending barley malt with soya bean. Dean reported that about half the milk in the diet of infants up to one year ago could be replaced by a barley malt-soya mixture without affecting the growth and nutritional status of the children. He also found that there was scarcely any difference in the growth of children given either milk or malt-soya mixture containing 10 per cent of skim milk powder, as supplements.

A process for the preparation of balanced malt foods,

based on blends of cereal malt, groundnut, sesame, soya, roasted Bengal gram flour and skim milk powder, and adequately fortified with vitamins and minerals has been standardised. Experiments carried out on albino rats have shown that the proteins of the malt foods possess a moderately high protein efficiency ratio. Incorporation of the malt foods at 10 per cent level in poor rice diet resulted in a significant improvement in the growth promoting value of the diet, comparable to that produced by an equivalent amount of skim milk powder. A feeding experiment extending over a period of 9 months carried out on weaned infants and young children showed that supplementation of their diets with 2 ozs. daily of Balanced Malt food A (Jowar malt 40; groundnut flour 40; Bengal gram flour, 10 and skim milk powder) brought about highly significant increases in their height, weight and haemoglobin, as compared with the control group, receiving a daily supplement of 2 ozs. of rice (Table 4).

The malt foods when cooked in about 8 parts of water, yield a highly nutritious porridge with a pleasant taste, and can be used for the supplementary feeding of weaned infants and young children.

Enriched Tapioca macaroni and related products

The technique of tapioca macaroni manufacture has been employed for the development of macaroni type protein-rich foods from compositions based primarily on blends of tapioca flour, groundnut flour, Bengalagram flour and wheat semolina. In order to augment the quality of protein in the products, casein non-fat milk solids have been incorporated into some of the formulations. These products are further fortified with calcium and vitamins A & D, riboflavin and calcium pantothenate.

These blends on treatment with boiling water, yield stiff doughs which are vacuum extruded in the macaroni press in the shaps of ringlets. These products can also be had in grain shape as pearls, grits, flakes etc. The extruded product is steamed for about 10 minutes before drying. Steaming

improves the keeping quality, flavour and cooking quality of the products. These cook readily in about 4—5 minutes. and the cooked products can be fed to weaned infants and young children in place of cereals, as gruel or porridge with or without added milk. Various other dishes can also be made for consumption by adults.

Studies with albino rats have shown that the proteins of the different macaroni products are of a fairly high nutritive value. The foods, when fed as the sole source of nutrients, promote good growth (15—17g/wk.) in rats over a period of 8 weeks . In a feeding trial on weaned infants (8—36 months of age) extending over a period of 6 months, it has been observed that a daily supplement of 2 ozs. of enriched tapioca macaroni brings about highly significant increases in height, weight and haemoglobin levels as well as improvement in nutritional status (Table 4) as compared with a control group receiving 2 ozs. of ordinary tapioco macaroni,

Roller-dried Protein foods

The possibilities of making protein foods from blends of cereal flours, oil seed meals and legume flours adequately fortified with vitamins and minerals available in the form of flakes have been shown by Narayana Rao *et al.* These can be given as supplements to diets of weaned infants and young children in the form of porridge with or without added milk. In their preparation, the blends of different flours are dispersed in water to make a suspension containing 20 per cent solids which is then steamed for 15 minutes and dried on a stainless steel twin roller-drier at 40 lbs. steam pressure. A process for preparation of a roller-dried protein food from a blend of cereal flours (rice or wheat) groundnut flour and cocount honey, containing 26 per cent protein and adequate amounts of vitamins and minerals has also been standardized. Growth studies on albino rats have shown that the proteins of the food possess a fairly high nutritiive value (PER of 2.1). Feeding trials to study the efficacy of the food in supplementing the diets of weaned infants and young children will be undertaken shortly. Possibilities of increasing the protein content, and nutritive

value of the proteins in the roller-dried foods by incorporating cereal flours from oats and buck wheat instead of rice or wheat are being explored.

Protein foods suitable for the treatment of protein malnutrition in children

Skim milk powder and calcium caseinate have been widely used in India and other countries for the treatment of protein malnutrition in children. Due to scarcity and high cost of these foods, investigations have been carried out by a number of workers in India and other countries in the use of blends of oil seed meals, Bengalgram and skim milk powder for the purpose. The major difficulty in the use of these foods, is the fact that they have to be administered in considerable bulk to provide adequate quantities of protein. This difficulty can be overcome by the use of proteins isolated from oil seed meals and legumes, which are 2–4 times as rich in proteins as the parent material. Suitable blends of isolated proteins and skim-milk powder, can be prepared so as to provide proteins of high nutritive value. Studies carried out with such blends have shown that they are equally effective as skim milk powder in initiating a cure in children suffering from kwashiorkor.

The following blends have been tested: Blend I, a 3:3:4 blend of groundnut protein, soya protein and casein fortified with 1-lysine and dl-methionine; Blend II, a 52:48 blend of groundnut protein and skim milk powder; Blend III, a 2:1 blend of groundnut protein and skim milk powder and Blend IV, a spray dried protein food containing 35 per cent protein (2 parts contributed by groundnut protein, and 1 part of by skim milk powder). Blend IV, has the advantage over the other blends, in that it readily reconstitutes in water, yielding a milk-like emulsion.

In all 54 cases of kwashiorkor (aged 1-5 years) were treated with the different blends. Each child, in different groups recived 30 g. protein from one of the protein blends or skim milk powder. The protein blends are readily digested by the children; and diarrhoea stopped in a shorter time, in children receiving the blends, as compared with those receiving skim

milk powder. The results are given in Table 5. The serum protein content and albumin/globulin ratio were brought to normal levels after treatment with the different foods for a period of 30 days.

The important advantages of the protein blends over skim milk powder are (i) they are about twice as rich in protein as skim milk powder (ii) use of such blends will help to extend 3-5 fold, the available supplies of skim milk powder in several tropical and sub-tropical countries and (iii) such blends contain less lactose than skim milk powder and hence diarrhoea is controlled earlier. In addition, the cost of the protein blends, when compared on the basis of their protein content, will be considerably less than that of skim milk powder.

Milk substitutes of vegetable origin, for the supplementary feeding of infants and children

A large amount of work has been done in different parts of the world on the use of milk substitute of vegetable origin, as supplements to the diets of infants and children. Soya milk has been widely in use in China for the past few centuries for feeding of infants. There are also several other oil-bearing seeds and nuts, which could be processed to yield milk-like emulsions. Though by themselves, none of these products can be considered as adequate substitutes for cow's milk their nutritive value can be improved by suitable methods of processing and supplementation with minerals, vitamins and amino acids.

By a simple process of soaking, mashing and extraction with water, soybeen can be made to yield a milky emulsion, but the product has a strong beany flavour. De and Subramanyan and Desikachar *et al.* effected a number of improvements in the preparation of the milk and the resulting product had an agreeable taste and possessed high nutritive value. A comprehensive programme of work carried out at Bangalore during the years 1946–49, to assess the value of the milk, in the feeding of infants and children, showed that the milk as well as the

lactic fermented curd were readily acceptable and possessed a significant supplementary value to poor cereal diets.

The processing of groundnut for the production of vegetable milk, unlike in the case of soy bean, offered certain difficulties because of the instability of the emulsion to heat as well as a strong nutty flavour in the milk. These problems were largely solved by systematic studies on the emulsion and a method was standardized for the preparation of satisfactory products. The milk from groundnut was fortified with calcium salts and vitamins to correspond to the composition of cow's milk. A feeding trial carried out over a period of 6 months on girls aged 4–11 years showed that children receiving a daily supplement of 12 ozs. curds from groundnut milk, registered significantly greater increase in height and weight (Table 3) as well as improvement in nutritional status, as compared to the control group, not receiving the supplement. During the past ten years, the Institute at Mysore has produced and distributed substantial quantities of groundnut curds, to consumers in the city of Mysore.

The production and distribution of vegetable milk or curd as fluid products imposes certain restrictions on their extended use, in view of their limited storage life. If, however, such products are made available as dry soluble powders, they will possess the added advantage of compactness, ease of handling and transportation and storage. Spray-dried preparations of soy milk, such as 'Soyalac' and 'Mullsoy' are commercially available in the U.S.A. In recent years, a plant has been operating in Indonesia with the help of FAO and UNICEF for the production of 'Saridale' a spray dried milk substitute from blends of groundnut, soyabean and sesame. A spray dried vegetable milk powder from 2 parts of soya bean and 1 part of groundnut has been developed by workers at the Institute, and has been shown to possess high nutritive value. Fortification of the milk powder with dl-methionine or addition of 20 per cent of milk powder, enhanced the growth promoting value significantly.

Possibilities of the use of isolated oil seed proteins in the

preparation of substitute infant food has been shown. An integrated process for the extraction of oil and isolation of protein and other constituents from groundnut kernel has been worked out, and a commercial production unit for the groundnut protein isolate is under erection. The protein isolate obtained by this process is bland to taste, and can advantageously be used in the preparation of substitute infant and weaning foods. In their preparation, the protein isolate is peptized in alkali and mixed with calculated amounts of skim-milk powder, dextrimaltose and buffer salts and if necessary, vegetable fat to bring up the fat content. The mixture is than homogenized and spraydried. The product is fortified with vitamins and minerals by dry mixing, before packing. They have been produced on a factory scale and for evaluation used studies on infants and weaned children. Incorporation of coconut honey (concentrated skim milk solids from coconut) in the above formulations has been found both to improve their acceptability and nutritive value.

CONCLUSION

Protein malnutrition which is responsible for the very high mortality in children in the tropics and sub-tropics, has been the one that is most widely prevalent among the various nutritional deficiency states. In addition to the acute cases of protein malnutrition (Kwashiorkor), there are a large number of border-line cases suffering from varying degrees of under-nutrition with multiple deficiencies. Milk, meat, fish, eggs and other protective foods of animal origin are in short supply in many of the developing countries like India, and the high cost of this class of foods have taken them beyond the reach of the low income groups. Realising the gravity of the nutritional problems in these areas, international agencies like UNICEF and CARE have been providing free supplies of skim milk powder to a limited extent, but this would suffice to meet the needs of only a small percentage of the children.

In view of the rapid increase in the growth of population and the low *per capita* availability of arable land in our country, the answer to the problem of nutritional well being of the

vulnerable groups can be provided by better conservation, processing and enrichment of food materials which are readily available, but have not been adequately used in readily acceptable and easily assimilable forms, as articles of human food. Researches carried out at the Central Food Techonological Research Institute, Mysore, for over a decade and which have been presented in this paper have been directed towards this end. Major emphasis has been placed on the preparation of edible quality products from oilseeds, particularly low-fat groundnut flour, which can go into the production of a variety of concentrated and nutritious foods to meet the requirements of children as well as different other sections of the people. Such concentrated protective foods have the added advantage that they can used by people without in any way affecting the existing dietary patterns.

The following products which have been developed. standardised and evaluated for their nutritional value have been discussed in this report.

(i) Processed foods based on blends of protein-rich oilseed meals and legume flours suitably fortified with vitamins and minerals, such as Indian Multipurpose food, and which can be used as effective supplements to the diets of school children and other vulnerable groups of the population. Edible fish flour can also be incorporated in these products, to enhance their nutritive value.

(ii) Enriched macaroni products and balanced malt foods which can be fed to weaned infants and older age groups suffering from protein deficiency states.

(iii) Processed foods based on groundnut protein isolate and skim milk powder, which are effective in the treatment of kwashiorkor in children. These are attractive water dispersible products which can be administered, in the same way as milk, with beneficial results.

(iv) Infant food substitutes based on blends of groundnut protein isolate, coconut concentrate, dextri-maltose and skim milk powder and spray-dried milk substitutes from blends of oilseeds such as groundnut, sesame, soya etc., which can be used as supplements to the diets of infants and children.

While the many possibilities for using oilseed meals, legumes, as well as their protein isolates for the preparation of processed foods have been shown, much headway has yet to be made in the manufacture of these products on a large scale and in making them available to the people. A large amount of educative work is also needed in the promotion of such products. The Government of Madras has already taken the lead in the matter of introducing the Indian Multipurpose food, in the mid-day meal programme for children in the state. This has already gained World recognition and the fine lead given by the State is looked upon as a model for others to follow. With such a fine example before them, other states have also been showing keen interest in similar projects. The UNICEF has recently donated the equiqment for two plants, for the production of groundnut flour, each with a capacity of 10 tons per day and the Ministry of Food, Government of India have taken steps for the popularisation and use of the product in different formulations such as enriched 'atta'. Multipurpose food, 'Nutro' biscuits etc. A fair amount of success has been achieved in the production and use of groundnut flour in processed foods and it is hoped that the other types of foods developed at the Institute will meet with a greater measure of approval resulting in the betterment of the health of the population.

OF THE IMMEDIATE MEASURES THE MOST URGENT ARE THOSE THAT CONCERN VULNERABLE GROUPS — THOSE GROUPS MOST AFFECTED BY PHYSIOLOGICAL STRESSES AND STRAINS, WHO ARE AT THE SAME TIME LEAST ABLE TO OBTAIN FOR THEMSELVES THE RIGHT KINDS OF FOOD. THE HEALTH OF THE CHILD IS THE KERNEL OF THE PROBLEM BUT IT IS NECESSARY TO BEGIN BEFORE THE CHILD IS BORN......

TABLE I: Production of Major Oilseeds and legumes in India and some regions and selected countries of the world

(1000 metric tons per annum during 1958)

Region or country		Peanut	Cotton Seed	Sesame	Copra	Chickpea	Beans	Soya
World production (excluding USSR)	...	14,000	16,000	1,700	2,900	6,400	8,600	27,800
North America	...	830	4,350	...	...	...	1,920	15,960
Latin America	...	750	2,310	170	225	140	2,540	130
Near East	...	220	1,770	240	...	130	215	10
Far East	...	8,720	6,659	1,180	2,300	5,790	3,280	11,650
Africa	...	3,480	600	120	120	140	645	20
India	...	4,893	1,673	501	233	5.059	1,455	...
Indonesia	...	382	...	...	620	...	...	422
Mexico	...	82	905	115	164	108	519	...
Brazil	...	333	751	...	...	...	1,476	131
Nigeria	...	1,050	60	12	6	...	...	10

* FAO Production Year Book, Vol. 13, 1959.

TABLE II: Chemical Composition* of different protein foods (value per 100g)

FOODS	Protein (Nx 6.25 (g)	Fat (g)	Carbo-hydrates (g)	Calcium (g)	Phosphorus (g)	Iron (mg)	Thiamin (mg)	Riboflavin (mg)	Nicotinic acid (mg)	Vitamin A(I U.)	Vitamin D(I.U.)	Calories
Infant Foods: besed on												
Groundnut protein isolate & skim milk powder	26.2	18.4	47.3	0.95	0.73	4.0	0.9	1.5	6.0	1500	400	460
Coconut honey, groundnut protein isolate & skim milk powder	26.0	18.2	46.8	1.10	0.80	4.0	0.6	1.5	6.2	1500	400	453
Dried milk substitute from soya & groundnut	24.7	18.6	51.5	1.05	1.13	7.2	0.85	1.23	8.2	2120	400	472
Milk food	26.6	18.5	46.5	1.04	0.92	4.0	0.52	1.46	1.2	1360	400	459
Processed Protein foods												
Indian Multipurpose Food (Formula A & B)	41.9	8.5	35.8	0.67	0.82	5.1	1.03	3.00	14.0	3000	300	387
Indian Multipurpose Food (Formula C)	40.6	7.0	39.0	0.80	0.86	4.2	1.11	2.80	10.4	2400	240	381
Protein food containing coconut meal	36.5	7.6	39.4	0.88	0.65	5.5	1.82	3.11	10.5	3000	300	382
4:1 blend of groundnut flour & skim milk powder	47.2	8.2	27.8	0.85	0.67	4.3	1.85	3.52	15.7	3000	300	365
Protein food containing fish flour	51.6	5.3	28.4	1.30	1.51	2.8	1.51	2.10	9.9	3000	300	368
Balanced Malt food A.	31.9	4.9	48.0	0.58	0.55	6.7	1.50	3.00	8.5	3000	300	364
Enriched Tapioca macaroni	18.0	0.9	66.7	0.49	0.42	3.2	0.68	0.70	5.6	1500	100	347
Roller dried foods: based on												
Soya & groundnut	47.8	14.2	18.5	0.96	0.80	6.5	1.16	1.60	16.0	1500	300	393
Rice, groundnut flour and coconut honey	25.6	4.0	61.1	0.95	0.85	6.2	1.5	3.0	12.0	1500	300	383
Skim milk powder *	35.6	1.0	52.0	1.30	1.03	0.6	0.35	1.96	1.1	...	...	359

* on fresh weight basis

* given for comparison.

TABLE III : Mean protein intake and mean increase in height, weight, Haemoglobin and red blood cell count of school children in the control and experimental group

EXPERIMENT	Department of experiment (months)	Group	No. of children per group	Age (years)	Diet	Mean protein intake (g/day)	INCREASE IN Height (cm)	Weight (kg)	Haemoglobin (g/100 ml blood)	RBC (10^6 cu.mm.)
I	5	Control	23 girls	4-12	Rice diet	24.4	1.32	0.45	0.13	0.07
		Experimental	23 ,,	4-12	Rice diet Multipurpose food	45.0	2.44	0.19	1.00	0.33
II	8	Control	20 boys	5-12	Rice diet	42.1	3.22	0.57	0.08	0.08
		Experimental	20 ,,	5-12	Rice diet protein food containing coconut meal	62.1	4.09	1.50	0.59	0.22
III	8	Control	21 girls	4-11	Rice diet	25.2	1.60	0.58	0.17	0.25
		Experimental	21 ,,	4-11	Rice diet groundnut curds	35.4	2.44	1.16	0.21	0.28
IV	6	Control	29 boys	4-12	Rice diet	49.0	1.80	0.98	0.60	0.28
		Experimental	29 ,,	4-12	Rice diet protein food containing fish meal	67.2	3.20	1.99	1.25	0.43

TABLE IV. Mean protein intake and mean increase in height, weight and haemoglobin of young children receiving different protein supplement.

Experiment No.	Duration of experiment (months)	Group	No. of children per group	Age years	Diet	Mean protein intake (g/day)	INCREASE IN Height (kg)	INCREASE IN Weight (kg)	INCREASE IN Haemoglobin (g/100ml. blood)
I	3	Control	23 boys	1¼ - 2½	Rice diet	19.8	0.82	0.34	0.35
		Experimental	23 boys	1¼ - 2½	Rice Diet + 4:1 blend of groundnut flour & skim milk powder	38.7	1.40	1.02	0.81
		Control	23 girls	1¼ - 2½	Rice diet	19.3	0.70	0.32	0.32
		Experimental	23 girls	1¼ - 2½	Rice diet + 4:1 blend of groundnut flour & skim milk powder	38.2	1.20	0.98	1.06
			8 boys	9/12	Rice diet				
II	9	Control	8 ,,	9/12-2½	Rice diet + M P F	21.0	4.30	0.74	0.36
		Experimental I			(formula C)	41.3	6.38	1.95	1.21
			8 ,,	9/12-2½	Rice diet + malt food	34.4	5.46	1.91	1.21
			10 girls	9/12-2½	Rice diet	21.3	3.51	1.02	0.23
		Experimental II	10 ,,	9/12-2½	Rice diet + M P F				
		Control			(formula C)	40.6	6.17	2.34	1.55
		Experimental I	10 ,,	9/12-2½	Rice diet + malt food	34.9	6.18	2.29	[illegible].22
		Experimental II	16 boys	8/12-3	Rice diet	23.0	3.86	0.92	[illegible].38
III	6	Control	16 boys	8/12-3	Rice diet + enriched				
		Experimental			tapioca macaroni	29.2	5.21	2.08	0.[illegible]7
		Control	17 girls	8/12-3	Rice diet	22.5	3.56	0.85	0.[illegible]1
		Experimental	17 girls	8/12-3	Rice diet + enriched				
					tapioca macaroni	28.4	4.95	2.02	0.94

TABLE V : Changes in body weight and serum albumin in cases of Kwashiorkor treated with the protein blends or spray dried protein food based on peanut protein isolate

		Protein Blend I	Protein Blend II	Protein Blend III	Spray dried protein food (protein Blend V)	Skim-milk powder
No. of cases treated	...	10	10	10	9	5
Age in years	...	2½—5	2—5	1—5	2—5	1—5
Body weight (kg)	Range ...	7.2—11 9	6.9—12.0	5.9—11.5	7.8—11.2	5 8—12.2
	Mean ...	8 8	8.6	8.2	9 8	8 5
Protein administered g/child/day–from protein food.		30	30	30	30	30
from cereals	...	8—10	8—10	8—10	8—10	8—10
No. of days taken for clinical disappearnce of oedema	Range ...	3—10	8—16	7—18	9—17	8—19
	Mean ...	5.8	12.4	14.5	11.7	12.3
No. of days taken for disappearance of diarhoea	Range ...	2—8	4—15	5.12	5—12	4—16
	Mean ...	3.5	6 5	6—2	8.9	9.8
No. of days taken for attaining minimum body weight	Range ...	4—12	8—17	8—19	6—18	9—18
	Mean ...	6.2	13.5	14.6	10.4	10.1
No. of days taken for increase of one pound body wt. calculated from 1st day of reaching minimum wt.	Range ...	3—6	7—11	6—15	6—10	6—14
	Mean ...	4.2	8.9	10 0	7.9	7.5
Rise of serum albumin on 10th day	Range ...	0.8—1.4	0.6—1.3	0.9—1 8	0.7—1.4	0.8—1.5
	Mean	2.10	0.89	1.1	0.97	1.0
Rise of serum albumin on 30th day	Range ...	1.5—2 7	1.1—2.3	1.4—2.6	1.6—2.7	1.7—3.0
	Mean ...	2.1	1.6	2.0	2.09	2.2

The Importance of Nutrition in Opthalmology

By

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NUTRITION is the most important single factor in the maintenance of health and well-being of man. Importance of nutrition in public health programme needs no defence. It is known to everyone that malnutrition and under-nutrition of various types are widely prevalent in our country. Dietary and nutrition surveys carried out in different parts of India have shown that the diet of the majority of the people in our country is ill-balanced and as a result of which, deficiency diseases of various kinds are widely prevalent amongst the various sections of population. Though the common deficiency diseases and other deficiency manifestation affecting the gastro-intestinal system, the skin and the skeletal system are well recognised and quite a lot of importance attached to them, other system have not received equal emphasis. Two possible reasons can be advanced for this :-

(1) Experimental work correlating nutrition with these system are not very common and as such very little is known about them. Examples can be cited to clarify this point. The effect of nutrition on the eyes or the effect on the nervous system have not attracted the attention of the research workers to the same extent.

(2) Whatever experimental findings are known, they are not generally utilised by the nutrition workers to act as an index of nutritional status. Thus they have not got the same importance in the hand of field workers.

The effect of nutrition on the different components of the eyes is a very vital problem since eye is a vital part of the body. The mainfestation of vitamin A or riboflavin deficiency on the different structure of the eye are well known but in recent years, more and more investigations have been done but with less amount of application. As such these findings are very little known in the field of nutritional ophthalmology. It must be confessed that nutritional opthalmology is an ignored field. The nutritionist, apart from giving a casual look at the eyes rarely go deeper and the opthalmologist do not feel that nutrition is a science which can be vitally important for them.

The effects of nutritional deficiency can vary as far as its effects on the eyes are concerned. On the one hand, there are the minor signs like the dryness of the cornea or conjunctiva or the vascularisation of the cornea and on the other, the Keratomalacia, a severe form of deficiency leading to blindness. In recent years nutritional opthalmology has attracted quite a lot of attention and the nutritionist, ophthalmologist and the biochemists are equally interested in this important field. Between these three disciplines and also supported by other allied ones, new facts have come to light and in many cases the original concepts have been changed. In this latter aspect, a re-orientation should be done to help the nutritionist and the ophthalmologist to do their field work efficiently. In this small article efforts will be made to highlight some of the recent findings in nutritional opthalmology. Many of these facts are known as a result of animal experiments, but it will be worth-while for the nutritionist and the ophthalmologist to be aware of these facts, so that their application in man might be assessed.

Nutrition and the Cornea

Cornea is an avascular transparent tissue and is engaged in vital function of vision. It is known that the cornea might have the following changes as a result of nutritional deficiency:

(a) Xerosis or dryness as a result of vitamin A deficiency.

(b) Corneal vascularisation as a result of riboflavin deficiency.

(c) Keratomalacia, a condition where the tissues of cornea necrose away very rapidly—possibly due to a colliquative necrosis–as a result of marked deficiency of vitamin A.

Xerosis of the cornea is an important sign and is widely used to detect vitamin A deficiency. It has also heen found to be very commonly present in pre-school age children in India, a finding which supports the fact that the intake of vitamin A in the diet of this group of population is far from satisfactory. However, it must be mentioned that very often this sign is missed because the procedure adopted to elicit this is far from satisfactory. A casual look at the cornea will not give a true picture until and unless the lids are held from blinking for atleast half a minute. The inspection should also be made from the side so that thickness and wrinkling of the surface of the cornea might be easily detected. It must also be mentioned in this connection that a proper detection of xerosis is of great importance, so that the deficiency is halted at this stage. This will go a long way in preventing blindness in a large number of children in our country.

Recent investigation carried out in the field of protein metabolism has shown that at least in the experimental animal the dryness of the corneal epithelium can be brought about by protein deficiency. It has, for example, been shown that an extreme form of methionine deficiency might produce corneal keratinisation indistinguishable from that produced by vitamin A deficiency. In a recent survey carried out amongst the children in the slums of Calcutta, it was observed that supplementation of their diet with protein can in many instances rectify this sign. Whether It is a direct effect of protein or an effect mediated through a better utilisation of vitamin A is not yet clear. Hewever, every field worker might do well to remember that xerosis might be due to protein deficiency and many apparently pardoxical findings in nutrition survey can be explained on this basis.

Corneal vascularisation :

This sign is always taken as a manifestation of riboflavin deficiency in field surveys. However, the investigations in rats

on the effect of aminoacid deficiency on the eyes of experimental animals have shown conclusively that a deficiency of protein and many of the aminoacids can be responsible for the vascularisation of cornea. Some investigations have also been done on human being, especially in children, and it has been shown that protein malnutrition might be an important factor in the vascularisation of cornea. This sign, presumably is a non-specific effect and it only indicates that the respiratory enzyme in the corneal tissue is inadequate to carry on the tissue respiratory processes. Thus, it was observed recently that a diet deficient in vitamin E but having an adequate amount of essential fatty acid produce corneal vascularisation in the rats. This finding supports the contention given before that in any condition of the cornea characterised by a lowered concentration of respiratory enzymes due to a deficient supply of building materials, a compensatory mechanism sets in, in which capillaries are attracted from the surrounding limbic plexus. This necessarily produces a distortion of the corneal stroma resulting in cloudiness.

Keratomalacia

There is some amount of ambiguity regarding the use of this term and that of xeropththalmia. It is generally accepted that keratomalacia is a condition which is characterised by a very rapid necrosis of the cornea leading to its perforation and thus causing permanent blindness. However, both these conditions are of grave importance to man and are supposed to be due to vitamin A deficiency.

Recently, however some investigations have been done in different parts of the world to show that vitamin A deficiency is not only the precipitating factor in either keratomalacia or in xeropththalmia. For example, some sorkers like Oomen and Yapp-Kie-Tong working in Indonesia have shown that protein malnutrition might be an important factor. It is true that keratomalacia and kwashiorkor mostly go hand in hand and biochemical evidences are also available to show that protein malnutrition can certainly precipitate vitamin A deficiency. The question however is not yet solved but the nutritionist and

ophthalmologist should both be aware that the two nutrient deficiencies that of protein and vitamin A –most widely prevalent in our country might be factors involved singly or jointly in the production of nutritional deficiency of grave importance like blindess. Yet these conditions are easily preventable and if detected in the early stage can very easily be cured.

Changes in the conjunctiva

It is generally known that the dryness of the conjunctiva can be due to vitamin A deficiency. However, some recent investigations in this line have helped us to recognise some other nutrient deficiencies in the conjunctiva. Pigmentation is one such to which sufficient emphasis has not been given It has now been found to be of considerable importance from the nutritional point of view. In some recent investigations, it was shown that protein malnutrition is manifested in the form of brownish or muddy discolourisation of the conjunctiva. It was surprising to observe the rapidity with which this pigmentation disappears on putting the child on a diet supplemented with skimmed milk.

Dryness, thickening and leathery condition of the conjunctiva is a very common manifestation of vitamin A deficiency. Thickening of the palpabral conjunctiva has been regarded for a long time as due to riboflavin deficiency, but a careful scrutiny in the field did not support this view.

Bitot's spot

This ophthalmic sign has attracted the largest amount of attention from the nutritionist and the opthalmologist alike. It has been reported for quite some time that there is no direct correlation between vitamin A deficiency and the occurrence of Bitot's spot. A study done recently has shown that Bitot's spot has a background of protein malnutrition on which vitamin A deficiency produces the final change. That Bitot's spot has no direct correlation with vitamin A deficiency has also been reported from surveys carried out in Ethiopia. The nutrition workers in the field would do well to remember that this common sign might mean a deficiency of protein and vitamin A alike.

Changes in th lens

The biochemistry and the physiology of the crystalline lens have been worked thoroughly in recent years. Along with this, quite a considerable amount of investigations have been done to find out the nutritional factors which might disturb the structure and function of the lens. It is for obvious reasons that all these investigations have been carried out in experimental animals like the albino rats, guinea - pigs rabbits and the pigs. It must be remembered that lens is an avascular tissue almost entirely made up of protein (about 66%) and is very rich in enzyme to carry on the metabolism. It has been shown recently that a deficiency of protein or a deficiency of certain aminoacid like methionine if carried out to an extreme degree might produce such biochemical alteration in the lens, that the structure is ultimately affected producing the opacity of the lens, a condition known as cataract. For example, it has been shown that a deficiency of protein in the young pigs causes complete and mature cataract. Similarly, an extreme form of methionine deficiency produced by an anti-methionine methionine sulphoximine produce such biochemical changes in the lens that ultimately structural disorganisation sets in producing mature cataract. Another finding of interest is the production of similar type of cataract as a result of X-ray irradiation of the eyes in some experimental animals like rabbits.

The application of these findings as far as human beings are concerned is still far from clear. However, there are some supporting evidences in this connection. For example, it can be argued that the protein malnuitrition in early years of life might produce such biochemical changes in the lens that it will not be able to withstand the ultraviolet radiation of the strong sun's rays in later years and early cataract sets in. Another important evidence in this connection is the occurrence of juvenile cataract in Indonesia reported by Oomen which he explains as due to sub-clinical damage of the lens in earlier years which progressess, rapidly with the setting in of a diabetic condition and ultimately mature cataract results in adolescence.

There is another field of the application of nutrition to ophthalmology—that of diet and emmetropia. In recent years, quite a lot of interest has been aroused as to whether a poor diet, especially in protein, might be a factor in the rising incidence of myopia. Gardiner, an English Ophthalmologist, showed that a rapidly advancing myopic process in children could be halted by supplementing the diet with sufficient amount of animal protein. On the face of it, this evidence is untenable on the basis of existing knowledge. However, a closer scrutiny regarding the possible effects of protein deficiency on the different structures of the eye, might throw some favourable light on this elusive problem.

In conclusion, one might venture to say that the topic of nutritional ophthalmology has along been a neglected field. Its importance in the field of public health is obvious. Hundreds and thousands of our people, especially the young children are suffering from different forms of malnutrition and as a result of which their eyes are affected in various ways. Their proper diagnosis and screening, which can only be done efficiently through public health services, will go a long way to prevent many of our future citizens to be permanent liability for the society.

NATION IN EMERGENCY . . . . .

IT WAS NAPOLEON WHO SAID "THE ARMY MARCHES ON ITS STOMACH". THE TRUTH OF THIS IS NOW MORE THAN EVER RECOGNISED. AS "MUNITION OF WAR", FOOD IS, THEREFORE, GIVEN EQUAL IMPORTANCE FOR MILITARY FITNESS" HENCE PRESERVE AND GROW MORE FOOD AND HELP THE NATION IN EMERGENCY.

NUTRITION EDUCATION AND TRAINING

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Note: *The views expressed in this article are those of the author alone and do not necessarily reflect the views or policies of the two United Agencies with which he is associated.*

Introduction

AS *a result of researches* and studies during the past 30 to 40 years, a fund of knowledge and information has been accumulated on the causes of syndromes, now known to be the result of dietary deficiencies, and on the ways whereby these can be prevented or overcome; while dietary and clinical surveys in many countries have provided valuable knowledge on the nature of diets, on the pattern of under-nutrition and malnutrition in many parts of the world and on the relation between diet and nutritional health.

During this period, India has been one of the leading countries in the field of *nutrition research*; and, as a result, the valuable contributions which have been made by workers in

the several well-known nutrition research institutions and laboratories of this country, have led to a good understanding amongst nutritionists of the pattern of malnutrition in India and its relationship to the health standards of the country.

In spite of all this work and resulting knowledge, it cannot be denied that, generally speaking, the incidence of malnutrition and undernutrition is still high. The valuable and skilfu researches in the field of nutrition have so far had little reallyl significant impact on the actual dietary habits and customs of people or on their level of nutritional health. I think it can safely be said that, if even a fraction of our present day knowledge could be applied in practice and on a sufficiently wide scale, much of the nutritional ill-health and misery which exists today would disappear.

Causes of malnutrition and under—nutrition

Among the principal causes of under—nutrition and malnutrition are poverty, ignorance and, to some extent, traditional beliefs and customs which prevent or reduce the consumption of some nutritious foodstuffs. It would be beyond the scope of this article to discuss the many economic, social and individual causes of poverty, but it should be noted that lack of knowledge can play quite an important role in the failure of peoples to make the best use of resources and facilities available to them and thus condemn them to lower economic levels than would be the case were they better informed.

Ignorance :

(i) It is probably true to say that ignorance is one of the most important single factors which can lead to both poverty and malnutrition. Without some knowledge of the basic human nutritional needs and the nutritional value of foodstuffs, it is impossible to make full use of available food resources. Ignorance of the special needs of infants and young children, of pregnant and nursing women, results in much preventable ill-health and many avoidable deaths; ignorance is frequently the cause for the failure of normal growth and the health development of children.

A poor housewife and mother can often make far better use of existing; limited resources in order to feed her family, and herself if she possesses some knowledge of the basic principles of sound nutrition, than can a woman who is in far better financial circumstances, but who is ignorant of these principles. Education can also enable members of a family to make better use of opportunities in order to improve their economic position; and will help to overcome prejudice, beliefs and customs which prevent the consumption of many valuable foodstuffs and the adoption of sound habits of health and diet.

Ignorance prevents farmers and land-owners from making full use of the potentialities of their land; leads to a continuance of obsolete and out-of-date agricultural practices, denies to farmers the opportunity to increase crop yields by taking advantage of better seed, fertilisers, modern methods of cultivation, conservation of soil fertility and the economic use of water; leads to victimisation by unscrupulous middle-men, money lenders and traders and prevents the primary producer from reaping the full benefits of credit and marketing facilities provided by Government. Finally, ignorance tends to encourage a fatalistic outlook, which may result in mental and physical lassitude. Acquirement of knowledge helps to break the vicious circle :

Poverty—malnutrition—lack of energy—poverty.

The opinion has been expressed by some people that there is no need to teach rural people simple dietary and nutritional facts, since they would naturally eat more food, provided that it can be made available to them. That is undoubtedly true to a limited extent ; but even the availability of unlimited food would not necessarily ensure that a mother would know how best to wean her children and to feed her family. It is an undoubted fact that some families, with adequate financial resources and the economic ability to obtain adequate food, can still include children and others who, as a result of inadequate knowledge of the value of foods, do not receive the proper amounts of the *right kind* of food and can thus suffer from malnutrition.

(ii) **Traditional beliefs and customs:**

It is most important that all who are, or are likely to be, associated with attempts to improve nutritional standards amongst rural communities should, first of all, make himself or herself, familiar with local food customs, habits and beliefs, particularly those associated with pregnancy, child-birth, the diet and treatment of women after child-birth and while nursing her baby, and with traditional methods for weaning the child and for feeding young children. Some of these customs may be beneficial and in line with present day knowledge; these, of course, should be carefully fostered and encouraged.

On the other hand, many customs and beliefs are based on false ideas and ignorance. Strict adherence to these traditional beliefs and customs make it difficult for modern and sound dietary principles to be accepted and adopted. In trying fo overcome them, it is essential io understand and appreciate the underlying reasons for them, so that the reasons why these customs and beliefs are wrong can be sympathetically explained to, and understood by, those whom it is desired to influence. Examples and visual demonstrations of the value of sound habits and dietary practices, when these can be arranged, are more effective than verbal or written explanations and exhortations.

Prevention of Malnutrition:

Just as there are many underlying causes of under-nutrition and malnutrition, so there are many ways of attacking the problem or, to put it in another way, the problems of under-nutrition and malnutrition must be attacked, simultaneously, from many directions.

The time has long since passed when nutrition can be regarded as the sole responsibility of medical and health personnel and of medical and biochemical research workers. No longer can the responsibility for the reduction or elimination of malnutrition be regarded as resting solely on Medical and Health Departments. As is shown below, the problems of under-nutrition and malnutrition can only be adequately tackled by the closest co-operation and co-ordination of effort between

administrators, many different Departments of Government, unofficials and elected representatives of the people, members of voluntary organisations and, ultimately, by the people themselves.

(i) **The role of Medical and Health personnel :**

In fighting malnutrition, medical and health staffs and the staff of medical and nutrition research institutions have, and will always have, a vital and fundamental part to play in the definition of the patterns and the incidence of malnutrition, in the study of biochemical, physiological and pathological aspects of nutrition and, through the staff of Maternal and Child Health Clinics and Primary and Rural Health Centres in teaching women how best to feed themselves and their babies and how to prevent the immediate post-weaning period from being so dangerous for the survival of the toddler, as is so often the case today.

Nevertheless, however skilled they may be, the rural medical and health officers, the health inspectors, the lady health visitors and the midwives cannot, by themselves, prevent under-nutrition or malnutrition. They can recognise cases when they encounter them during the course of their normal duties and can often prescribe and supply vitamin concentrates and protein-rich preparations in order to try and *cure* those who are already suffering from deficiency conditions; they can recommend changes in the diet and the inclusion of more protective foods and so on; but they cannot, by themselves, *prevent* the occurrence of malnutrition. The dispensing of protein concentrates, milk powder, vitamin pills and shark liver oil, scarcely touches the fringe of the problems. The *prevention* of under-nutrition and malnutrition depends fundamentally on *increased production* of food; and not only the increased production of food, but the increased production of the *right kinds of food*. This, in turn, requires knowledge and the right kind of knowledge. It seems appropriate here to quote the words of Mahatma Gandhi, who wrote :

"I have little doubt that if people understood the laws of dietetics and acted accordingly, a tremendous economy in food could be effected."

(ii) **The role of the Producers of Food:**

The production of food has traditionally been, and still remains, the prime responsibility of agriculture, which, in its widest sense, includes animal husbandry. In this responsibility, the fishing industry also plays its part. In accepting these responsibilities, the primary producers of food must be assisted by the advice of trained agriculturalists, veterinary and animal husbandry experts and of those experienced in inland and marine fisheries, by the services of soils chemists, irrigation and agricultural engineers and by all those whose training and experience qualify them to assist in increasing the productivity of the soil, of livestock and of fishing grounds and to encourage the increased production of food—not only of cereal and starchy root foodstuffs—but also of the valuable protective foods, such as green leafy vegetables, pulses and legumes, fruits, poultry, eggs, fish and meat. Here also is the field of responsibility for the extension workers.

It is of little value to the country as a whole if, for example, increased crop yields from the use of improved seed, fertilisers, irrigation etc., are confined to agricultural research stations; if high yields of milk are confined to cows maintained only on Government Farms; or if egg production is doubled or trebled only in the case of hens maintained on State Poultry Farms. It is only when the improved production methods, which have yielded these encouraging results, are adopted by all farmers, on all farms, by members of Youth Clubs, Young Farmers Leagues and by members of rural Women's Associations throughout the country, that the results will, not only become nationally significant but, nutritionally, will mark the turning point in the battle against under-nutrition and malnutrition.

We all know that this process has begun. From many quarters, encouraging developments are being reported. But these efforts must be intensified. Research and the definition

of conditions for improved food production are essential for progress. Equally essential is the need for the rapid adoption of the results of these researches in the field, by those who are actually responsible for producing the food. The existing gap between research and practical field application of the beneficial results of this research must be reduced to a minimum.

(iii) The role of the Extension Worker :

It is on the shoulders of the extension worker that rests the primary responsibility for ensuring that the results of research are quickly translated into increased production in the field. The agricultural extension officer, the animal husbandry and the poultry field officer, the fisheries officer, all play an essential and vital role in the drive for increased food production and the battle against under-nutrition and malnutrition. It is their responsibility to keep abreast of the latest results from the research laboratories and institutions and to encourage and guide the farmers and other rural producers of food to adopt these improved methods, for the benefit, not only of the producers themselves, but of the community and nation as a whole.

It is not, however, sufficient that these extension workers should encourage the increased production of food. They should have some knowledge of the local patterns of malnutrition and of the relative nutrient value of the various locally available foodstuffs in combating under-nutrition and malnutrition. They should be in a position to advise the local administration and development officers on the relative emphasis that should be placed on the production of different foodstuffs and on other agricultural produce, e g. sugar cane, jute, tobacco, cotton etc., so that, in addition to assisting in the improvement of the economic position of the rural producers, due attention will be paid to the nutritional needs of the community.

Special attention should also be paid to the possibility for the utilisation of land, however small the ares may be, which,

hitherto neglected, can be made capable of raising food crops. Reference is particularly made to the cultivation of nutritionally valuable vegetables on patches of apparently waste land in the vicinity of homes and villages. The difficulties may, at first sight, appear to be great. The land may be infertile; if this is so, ways and means must be sought to improve the fertility. Stray cattle may pose a problem; methods must be sought to enclose the land for the production of the produce. Water shortage may appear to be in insuperable limiting factor; but, with the advice of the irrigation expert, conservation of surface and sub-soil water may be possible. In existing gardens, yields may have been disappointing and the pioneer vegetable grower may have become discouraged; the possibility of introducing improved varieties of seed and the use of pesticides must be explored and the grower encouraged to renewed efforts; and so on. The individual results may not appear to be spectacular when only small garden plots are considered. But, if everyone living in rural districts could each produce an average of one extra pound of vegetables per week, the result would be an increase of nearly 8 million tons in annual food production. This would amount to nearly 7 per cent of the total existing production of foodstuffs in India today.

In this connection, it may be desirable to remember the words of Mahatma Gandhi, who wrote:

"If every man were to realise the necessity of growing food wherever it can be grown, we shall soon forget that there was scarcity of foodstuffs in the land."

(iv) **The role of women :**

By virtue of their unique position in the family and in the community, women must shoulder a very large share of the responsibility for reducing and overcoming malnutrition. She is ultimately responsible for the feeding, of herself of her newly weaned child, of her older children and of her family as a whole.

At the present time, many women in rural communities are, through ignorance, poverty or, as the result of traditional customs and beliefs, unable adequately to discharge these responsibilities. It thus becomes the duty of those in a more fortunate position to assist rural women to overcome the many problems that face them and help them to safeguard the nutritional health of their families and of themselves. For many obvious reasons, the only satisfactory way to undertake these duties is with the help of trained and dedicated women, who are prepared to go out into the villages and the countryside to help and guide their less fortunate sisters towards a healthier, more satisfying and more rewarding life than has been their lot hitherto.

The increasing formation of women's associations, e.g. Mahila Samitis or Mahila Mandals in rural areas, will greatly facilitate the work of extension officers, such as the Mukhya Sevikas, Gram Sevikas, Officers of the Department of Women's Welfare, Gram Lakshmis and other qualified voluntary women workers, to help rural women to make full use of existing resources and to develop new ones, in order to overcome mal-nutrition and to improve their dietaries. At the same time the more personal advice and guidance of rural health staff, the Medical Officer in the Primary Health and MCH Centres, the auxiliary health nurse, the lady health visitor and the midwife, can help the individual during the critical periods of her pregnancy, child-birth, lactation and during the weaning and subsequent care of her toddler.

Well establised rural women's associations will be of inestimable help in the development of self supporting communal organisations in each village for the preparation and distribution under expert supervision, of supplementary meals for those members of the community, most in need of additional nourishment, namely the pre-school age child and pregnant and nursing women. Such associations are thus destined to play an ever increasingly valuable role in the battle against malnutrition.

(v) The role of the school-teacher :

It is a well-known fact that, as people grow older, they acquire habits, prejudices and customs which become a fixed feature of their lives and behaviour and which are difficult, if not impossible, to change. On the other hand, children are normally anxious to learn and are willing to acquire new ideas. If and when it is found necessary to change or modify the outlook and opinions of a community, it is easier to encourage the changes among the children than among the adults. This particularly applies to food habits. The role of the school-teacher is thus of vital importance in the battle to improve dietary habits (including personal dietary hygiene), to overcome malnutrition and to improve the nutritional status of the nation.

In playing his part in this vital battle, it is, of course, essential that the school-teacher himself be adequately informed of those practical aspects of hygiene and nutrition, as they affect his or her pupils. Suitable arrangements must be, and are being made to ensure that he or she will acquire this knowledge. It will then be the responsibility of school teachers to assist the pupils under their charge, to accept and adopt, as *part of their normal daily lives*, an attitude towards hygiene and diet which, based on sound principles, will enable them to develop into healthy and well-nourished members of the community. In this task, the school teacher will make full use of the educational value of school gardens and school meals, provided that these are organised on satisfactory lines. School meals, in particular, offer many opportunities to train the child to acquire a knowledge of sound dietary principles and natural habits of personal cleanliness and hygiene, which, it is hoped, will be retained thoroughout his life.

(vi) The role of the administrator :

In modern society and under present day conditions, the administrator can exert a profound influence on the success of plans and programmes designed to overcome malnutrition and on the speed at which they can be implemented. It is he who is ultimately responsible for the effective integration and co-ordination of the various lines of attack on the problems of

under-nutrition and malnutrition. It is he who, by appropriate allocations, must ensure the most effective use of available funds and resources; and he must seek ways to overcome bottle-necks and to find additional funds, if need be, to strengthen vital aspects of any development or educational programmes designed to increase the production, utilisation and consumption of nutritionally valuable foodstuffs.

In short, the administrator can play a most important and responsible role in the battle against malnutrition, especially in the difficult task of implenting and controlling development programmes, which may require detailed, planned inter-co-ordination between the staff of different departments and organisations.

In order that he can undertake these responsibilities with a full understanding of the problems involved and can judge for himself the importance and relative priorities, it is essential that he himself should be fully informed of the fundamental, basic principles of nutrition and of the overall nutritional problems of the community, should ensure that development programmes related to the increase of national, district or local resources should take into full account the nutritional needs of the peoples and should understand the difficulties and limitations which may face the field staff and technical officers at different levels, both official and unoffical who are required to implement such programmes.

(vii) **The importance of nutrition training and education :**

In discussing the respective roles of the health worker, the producer of food, the extension worker, the rural mother and housewife and the school-teacher, it becomes clear that the link, throughout all their activities, is the need for adequate training and education in nutrition, in its widest sense.

The skilled knowledge of medical and health personnel, in defining and recognising the existence of malnutrition, is of little value by itself, unless the knowledge is passed on to the producers of food through the extension workers in the field.

In this way, practical steps can be taken to reduce or prevent existing malnutrition by encouraging the production of additional foodstuffs. It is, however, of little use to produce additional food if the nutritional value of different kinds of foodstuffs is not understood by those who produce them, so as to enable these foodstuffs to be properly and economically utilised.

Furthermore, it is of little use producing additional protective foods, unless women appreciate their value and can be taught to conserve their nutrient value, by adopting suitable methods of preparation, preservation and cooking. The natural nutrient value of many foodstuffs can be seriously impaired between their production and eventual consumption, if unsuitable methods are used, and simple precautions neglected, during processing, transportation, storage, preservation and domestic utilisation.

It is clear, therefore, that, in order to take full advantage of existing and increasing supplies of food, the vital importance must be recognised of nutrition training and education, at all levels and amongst all peoples. The type and nature of the training to be given to, and the knowledge to be acquired by different groups of people will, of course, vary. The knowledge and experience in practical, applied nutrition required by an administrative officer, when handling problems of National or State food policies, will differ greatly from those required by a village woman to enable her adequately to feed her family. The nutritional knowledge and clinical training required by a medical or health officer will be different from the knowledge of the nutritional aspects of agriculture and technology required by an agricultural officer ; both will differ from the training and experience required by a Women's Welfare Officer or by a village level worker. Yet the fundamental principles remain the same—all that differs is the degree of knowledge required. The nearer to the village level, the more practical must the teaching become and the more strictly must it be related to the daily life and habits of those whom it is sought to influence.

While, for instance, qualified teachers of nutrition at Rural Extension Training Centres will require a sound, theoretical

background of applied nutrition, there is little need for a village level worker, who is being taught at the Centre, to be burdened with detailed theoretical knowledge. On the contrary, she should only be taught to know how to help the village housewife and mother to deal with the daily problems of her village life. This will include advice on the best kinds and qualities of locally available foodstuffs to be chosen and on suitable receipes and methods of cooking these food for the benefit of the family, and so on.

On the other hand, medical and health personnel who work in rural areas, should at least have some knowledge of the practical problems and activities of those responsible for the production of food and with the customs, prejudices and beliefs of those whose dietary habits they may wish to influence ; while agricultural and other extension officers should be informed of local patterns of malnutrition and the relative nutritional values of locally available foodstuffs, the consumption of which is necessary to overcome or prevent such malnutrition.

In other words, for the successful outcome of this battle against under-nutrition and malnutrition, the closest co-operation is essential between all those who are responsible in their various walks of life, for different approaches to these problems. To achieve this co-opertion, a mutual understanding of their respective roles, reponsibilities and difficulties is essential at all levels.

Conclusion :

This article would be incomplete without a reference to the Applied Nutrition Programmes which, with the encouragement of the Central Government and with the co-operation of the Food and Agriculture Organisation (FAO) and the World Health Organisation (WHO) of the United Nations and the United Nations Children's Fund (UNICEF), are being developed in the State of Madras and also in Orisa, Uttar Pradesh and Andhra Pradesh. Plans are in an anvanced stage of development for the early implementation of similar programmes in several other States, including Kerala, Mysore and Madhya Pradesh.

These programmes are designed to attack the problems of under-nutrition and malnutrition by an integrated, co-ordinated approach which, in time, is likely to produce tangible and effective results, provided that everyone, who is associated with implementing the programmes, understands their objectives and can pull together as a team. These programmes aim to assist members of a village or community to produce, by their own efforts, more protective foods such as nutritious vegetables, fruit, eggs, fish and milk. At the same time, by training those who work in close association with the village people, in a simple knowledge of practical applied nutrition, it is hoped that the farmers and housewives in the villages will learn the value of these protective foods and the importance of including them in their diets and those of their children.

It is also hoped that, by increasing the production of these foodstuffs, economic levels in the villages will be raised by the sale of some of the produce, although, of course, it is essential that a portion is retained for consumption by the producers themselves. Furthermore, every effort is made to encourage the formation of women's associations in the villages—if they do not already exist—or to assist the members of existing associations to expand their activities. These include the development of poultry units, vegetable gardens and, where there is a suitable pond, to start a fish farm. The members of these associations are also encouraged to prepare and supply supplementary meals, which include some of the produce obtained as a result of the programme, for the benefit of pre-school and school children and for those women who are in especial need of extra nourishment.

In addition, encouragement is given to the development of community, school and home gardens and to help members of Youth Clubs, Young Farmers Leagues and others who may be interested to grow vegetables and fruits or keep poultry. At the same time, the programmes aim, with the support and help of the Departments of Education and the school teachers, to teach children the value and importance of protective foods;

how to produce them—by the development of school and home fruit and vegetable gardens—and how to include them in their diets, by the supply of wholesome and nutritious school meals.

At first, progress in the development of these programmes may appear to be slow, as it takes time for those who are associated with the work fully to understand the purpose and objectives of the programmes and how they are to be attained ; it also takes time to help and guide village people in the production and utilisation aspects of the programmes. Nevertheless, sufficient initial progress has already been made in two States, to encourage the State Governments greatly to expand the scope of the projects to additional districts, blocks and villages. If, therefore, the initial projects succeed and the scope is gradually extended, it is expected that the Applied Nutrition Programmes will cease to be regarded as separate projects. When that time comes, the integrated approach, implicit in these programmes, will beome a normal and regular feature of community development and of rural social and communal life ; while a more general understanding of simple nutritional principles and the ability to apply them in the general dietry patten will lead to a healthier and happier life than may sometime be the case today.

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HEALTH ON A. I. R.

Health awareness among the people is a vital factor to reckon with. The task of informing the people on health has been undertaken by the Health Education Bureau. The following programmes will be broadcast from Tiruchy station of All India Radio in their Rural programme which is broadcast from 6-20 & 7-15 p.m.

SUBJECT :		DATE :
(1)	Ad Hoc Census	... 2-7-1963
(2)	Food and Nutrition	... 23-7-1963
(3)	Small pox programme	... 24-6-1963

The Material Section of the Health Education Bureau has the following Health Education Materials on Nutrition

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I. PAMPHLETS

(1)	Menus of Cheap Diets	... (Tamil and English)
(2)	School Garden	... (Tamil)
(3)	How do you Score	... (Tamil)
(4)	Your Health How to improve it	(Tamil)
(5)	Rice We eat	... (Tamil & English)
(6)	Simple Food Receipes	... (Tamil & English)

II. POSTERS

Rice and Better Health
Food Adulteration

III. FILMS

1. FOOD FOR HEALTH

Tamil 151 6 meters B & W 14 Mins.

Food is taken not only to apease hunger, in which case any food would do. The food we eat is one of the commonset factors contributing to our well being. This documentary explains the three main types of foods we require, analyses in detail their properties; discusses the contents of a balanced diet and suggests the correct way for cooking some foods.

2. FOOD THAT BUILDS GOOD HEALTH

English 110 meters B & W 10 Mins.

Basic foods like Milk, Vegetables, Fruits, Eggs, Meat, Bread and Butter are all necessary for good health. Demonstrations are shown with two rats; Pat and Mike with Balanced and un-balanced diets. The difference is explained in a graphic way.

3. **FOOD AND NUTRITION**

English 110 meters B & W10 Mins.

Body needs carbohydrates, fats, proteins, minerals and vitamins. The film explains these in detail and also gives the mechanism of disgestion in a graphic way. Also is explained how the Basal metabolism chart and Body charts are made. Experiments with rats about the rate of growth with protein diet

4. **FOOD YOU DID NOT EAT**

Tamil and English 250 meters B & W 10 Mins.

It deals with principles of Nutrition, importance of eating the right kinds of food to keep fit.

5. **FUNDAMENTALS OF DIET**

English 110 meters B & W 10 Mins.

This film deals about the essential foods we eat every day like Milk, Egg, Vegetables, etc, which are responsible for life, Health and Growth.

6. **GOOD EATING HABITS**

English 110 meters B & W 10 Mins.

The little hero of the film "Bill" gets stomach ache after his dinner--why? In the morning he is late for school and so gulps his breakfast whithout eating fully the same for lunch.

7. **DIGESTION OF FOOD**

English 110 meters B & W 10 Mins.

The film explains in detail the *mechanical and chemical* action of the different stages of the process of digestion by a series of demonstrations.

8. PLANNING FOR GOOD EATING

English Cartoon 100 meters Colour 9 Mins.

Explains why man needs a variety of foods to be healthy–animal foods to build muscles, vegetables and fruits to help build sound bones and teeth; grains and roots for energy. The combination of all three types builds resistance against disease. Shows that the variety needed can be grown on a small plot of land.

9. PROFITABLE PASTIME

Tamil 130.2 meters B & W 12 Mins.

This film describes various interesting hobbies which help one to combine pleasure with profit. The stress is on poultry keeping, vegetable gardening and be keeping as spare time occupation which bring ample of dividends.

10. SUBSIDIARY FOODS

Tamil 117.3 meters $10\frac{3}{4}$ Mins.

Balanced diet is the subject of this film. It gives an account of Basic foods necessary for the upkeep of the body and shows how foods, especially cereals in each groups can be substituted by other foods, like fruits, potatoes, yams, tapioca, green vegetables etc. without any loss of nutritive value in the diet.

11. VITAMIN B_1

Silent 110 meters B & W10 Mins.

Vitamin B_1 is found in whole grain products. Eggs; vegetables, Fruits, Milk, Liver and Kidney. Synthetic vitamins are also produced in large quantities. Interesting experiments with Birds and rats are demonstrated to explain vitamin B_1deficiency. Beri-Beri a disease caused by vitamin dificiency can be cured.

12. WHITE MAGIC

Tamil 110 meters B & W 10 Mins.

The need for Milk for growing children is explained in this film. A story about school children and the nutritional deficiency demonstrated by giving different kinds of foods to different classes. Children who are given milk show good growth.